The Chemical Age

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Notes and Comments

I.C.I. Interim Dividend

THE directors of Imperial Chemical Industries, Ltd., have declared as at September 20, in respect of the trading year ending December 31 next, an interim dividend of 2½ per cent. actual on the issued ordinary capital of the company. This dividend will be payable, less income tax at 4s. 1d. in the pound, being United Kingdom income tax at 4s. 6d. in the pound, less Dominion income tax relief at 5d. in the pound, on November 1, to shareholders on the register on September 20. In view of the large increase in the earnings of the company last year and the optimistic tone of Sir Harry McGowan's speech at the annual meeting of the shareholders in April last, considerable hope had been entertained of an increase in the interim declaration, but the amount announced last week-end remains the same as it was twelve months ago.

Several other important companies have announced their interim dividends during the past few days, and in most instances the distributions show no change from those declared a year ago. The directors of Radiation, Ltd., manufacturers of gas cookers and fires, hot water apparatus, etc., are making no change in the interim ordinary dividend, which is to be 3⅛ per cent. for the eighth year; over this period the interim payment has regularly been followed by a final distribution of 9⅜ per cent., making 12½ per cent. for the year. The interim dividends of British Portland Cement Manufacturers and of British Insulated Cables are at the same rate as has been paid for many years past—namely, 5 per cent. Since 1926 the cement company has followed up this interim payment with regular final dividends of 10 per cent. Each year since 1923 the distribution of British Insulated Cables has also been made up to 15 per cent. after the close of the year, even though substantial capital bonuses have been distributed in two of these years.

The Expert Witness

WE are all fully aware of the legal dictum that there are liars, d—d liars and expert witnesses; but we did not think that the legal opinion of the expert would ever have sunk so low as that of the eminent man of law who has recently in the course of a discussion upon the rising costs of legal actions given it as his opinion that the expert should not be entitled to any fee. To be charitable we suppose that the sentence was hastily interpolated amid the more solid argument in favour of reduction or limitation in the fees of lawyers. We can well believe that no lawyer should—in these democratic days—be paid an annual income of many tens of thousands a year; but while such incomes can be commanded by those whose business it is to present facts with a bias, let it not be assumed that those upon whom the aristocrats of the bar often depend for their facts should be left to starve, and be prevented from receiving the few tens of pounds that fall from the table of those who receive their thousands. The expert witness is in a curious position and there are varying opinions upon what should be his functions. Should the expert witness be independent of either side? Should he, like the lawyer, be briefed specifically to put the facts that are favourable to one side and unfavourable to the other?

No doubt the ideal expert witness would be completely unbiased and would inform the court what was the truth of every statement made; with such a witness available our "jesting Pilates" would no longer have to ask "what is truth?" and not remain for an answer. Unfortunately, things are not so simple as this. In the first place, one side or the other engages experts as witnesses. These witnesses are paid by the side that engages them upon the reasonable assumption that the witnesses will give evidence supporting the side that engaged them. We can imagine the qualms of conscience that might assail a witness who discovered, possibly too late to withdraw, that his side was endeavouring to uphold a scientific inexactitude. On the other hand, is the position of such an expert any more anomalous than that of the employee of a firm whose directors decide to sell some new article or process and who is ordered to think out technical reasons why it can and should be bought by customers in order to replace existing articles or processes?

Limitation of Knowledge

EVERY industrial chemist and engineer whose position brings him in any way into contact with the sales side of his organisation is faced with this task at some time or other—and frequently, almost daily—and all too often the said article or process has been adopted without or even against his advice. "Truth is only falsehood well disguised." In the courts truth lies at the bottom of a well, and the mouth of that well is guarded by a multitude of counsellors. The most usual type of expert witness is the one whose apparent business it is to put forward the facts that will assist his side. Is this type of expert witness morally justifiable? One answer to that is that where the facts are irrefutable the expert witness should tell the truth the whole truth and nothing but the truth regardless of

the interests of those who pay his fee. But is that answer any more moral—since it must inevitably let down his employers—than the alternative to dissemble the truth? We recollect spending some amusing hours in the company of skilled expert witnesses who have related the methods by which they have prevented over-inquisitive opposing counsel from receiving a direct and unequivocal answer. The path to be pursued by the expert witness may be one of great moral difficulty.

If this were all the work of the expert witness we might even be tempted to subscribe to the opinion of the writer quoted above that the expert should be officially fee-less. We have no doubt that experts are much too busy to waste their time at the courts and the expert witness would consequently disappear—unless he were paid in advance by his client. The difficulty is more often than not that cases have to be decided because of our limitations of knowledge. If the facts and the causes leading to those facts were not in dispute there would be no need of expert witnesses. It not infrequently happens that two or more quite honestly held opinions may be the subject of debate; experts frequently disagree—it is only necessary to visit any meeting of a learned or technical society and listen to the discussion to recognise that. Where there is such a disagreement there is need to engage the services of the best brains to advise the court—a court assessor.

Selecting the Expert

UNFORTUNATELY the selection of an independent expert is a matter of extreme difficulty and the greater the need of an expert, the more difficulty there is in finding him. In these days of specialisation there are very few experts upon each particular subject. Every subject is again subdivided into subsidiary branches and the man who is an expert in one branch is not necessarily an expert in another. Fuel, for example, is a generic subject intimately related to the chemical industry. It might be supposed that to engage the services of a qualified fuel technilogist would be adequate—perhaps a Fellow of the Institute of Fuel. But no! Your expert in steam generation is not to be accepted as an expert in gas producers, nor can either of these be regarded as furnace experts or carbonisation experts. It is even doubtful how far a gas engineer can pretend to any knowledge of coke ovens and vice versa, so divided are the several sections of the one subject. Since there are so few who can be considered as expert in the widest and highest sense of the word, the selection can be made extremely difficult when some of these men are directly or indirectly connected with the parties.

It is recorded, for example, in the " Transactions of the Chartered Institution of Patent Agents " (1932, vol. li, page 55) that in a case in which Imperial Chemical Industries, Ltd., were the defendants, the judge suggested that an expert witness should be appointed as assessor to the court and asked the opposing counsel to recommend someone. " It was simply the problem of finding someone who would be independent, would have a knowledge of the subject matter and would commend himself to the two parties. There was extraordinary difficulty in getting someone who fulfilled these requirements. It proved impossible to get a dye chemist for the reason that there was no dye chemist whose name was mentioned who was not already committed to one side or the other directly or indirectly. Imperial Chemical Industries, Ltd., contributed to research work in practically all the universities and colleges, and every professor acquainted with dyestuff matters had to say: ' I cannot act because my institution is in receipt of a research grant from I.C.I.' Ultimately we got a chemist—a very capable gentleman—but one who would never have set himself up as a dye chemist, because his work had been concerned mainly with flames and explosions and combustion generally." Is such an expert really of value? Can it be of any real assistance to a Court of Law to have the advice of one who does not know nearly as much about the subject as the partisan experts of the parties?

The Neutral Assessor

WHILST one legal light suggests that experts should be eliminated by the simple process of non-payment of fees, the opinion of the Bench in general appears to be that the independent expert sitting as assessor to the court—a " court expert "—should be encouraged. The court has not the task of discovering the existence or otherwise of a simple fact but of forming the proper legal deduction from a number of facts presented to it. The witnesses testify to the facts; the court draws the deduction. Clearly a neutral assessor to advise the court as to the validity of the facts put forward by either side must be of the greatest assistance; clearly also, the neutral assessor must be a man of such high knowledge and experience as to command confidence even when he differs from the opinions and statements of witnesses. Such men are difficult to find, and when found are likely to be so busy that a fee comparable with that of leading counsel may still leave them out of pocket.

We are not sure that the assessor is needed save in a very few cases of quite remarkable difficulty. Most people are prepared to abide by the verdict of a man who is accustomed to weighing evidence and who is demonstrably unbiased as are His Majesty's Judges; unless the case turns on highly abstract questions of pure science, the court expert is not needed. There is much to be said for the procedure of the Admiralty Courts where the judges call in Trinity Masters as assessors; existing laws give to the judge ample power to summon assessors whenever he thinks it advisable and it is only necessary to do this more often in scientific cases to avoid the appointment of court experts. The difficulty of finding a suitable person to act as assessor, however, still exists.

World Cyanamide Output

GERMANY now holds an outstanding position in the world's output of cyanamide, and of a total world productive capacity of cyanamide of 534,000 metric tons N, around one-third or 180,000 tons N is in Germany. Before the war Germany's cyanamide capacity amounted to only 10,000 tons but rose sharply during the war to 100,000 tons in 1918, to record still further appreciable expansion in the post-war period, and in 1933 German cyanamide works had a total capacity of 180,000 tons N. World consumption amounted to 178,014 tons in 1932-33, compared with 144,668 tons in 1931-32, and 217,935 tons in 1929-30. Germany has relatively the largest cyanamide consumption of any country.

Further New Knowledge on Chemistry

The British Association Discuss Heavy Hydrogen and Fresh Milk

ON Monday the Chemistry Section of the British Association, at their meeting at Aberdeen, held a joint discussion with the Mathematical and Physical Science Sections, the subject—"The Physical and Chemical Properties of Heavy Hydrogen"—being introduced by Professor E. K. Rideal, F.R.S.

Dr. A. FARKAS dealt with some properties of heavy hydrogen. He said a micromethod has been developed based on the different thermal conductivity of light and heavy hydrogen. One can estimate by this method the relative amount of the molecular species H_2, HD and D_2 and of their ortho- and para-modifications in 2-3 $.10^{-3}$ cc. of gas (N.T.P.). The reaction between H_2 and D_2 proceeds in the gas phase above 500-600° C. according to both an atomic and a molecular mechanism, but can be catalysed at much lower temperatures. The equilibrium constant of this reaction is about 4 and nearly independent of temperature. It is shown that when H_2 and D_2 diffuse through a fine nozzle a separation accurs on account of their different molecular velocities. On the other hand, the different rate of diffusion through palladium is due to a different heat of activation for this process caused by the difference in the zero point energies of light and heavy hydrogen. In collaboration with Dr. Harteck it was shown that, similarly to the case of ordinary hydrogen, the ortho-para-conversion occurs also with D_2.

Kinetic Behaviour of Heavy Hydrogen

Heavy hydrogen and its bearing on problems in chemical kinetics in gaseous systems was the subject of Mr. H. W. Melville's contribution. In the investigation of the kinetic behaviour of heavy hydrogen compared with that of light hydrogen, the types of reaction may be divided into three classes: (1) Reactions of the free atoms; (2) reactions of the molecules; (3) catalytic reactions in which a compound of hydrogen is the intermediate product effecting hydrogenation. In each of these cases there are three factors which may cause the velocity of reaction of hydrogen to be greater than diplogen: (*a*) a collision factor, the maximum ratio being $\sqrt{2}:1$; (*b*) the contribution of zero point energy to the energy of activation of the reaction; and (*c*) the quantum mechanical leakage of the atoms or molecules through potential barriers, where these exist. As examples of the first class there are the mercury photosensitised hydrogenations of oxygen, nitrous oxide, ethylene and carbon monoxide, and the reduction of copper oxide. In the second class there are the hydrogen-chlorine and hydrogen-bromine reactions. In the third class, the hydrogenation of oxygen, nitrous oxide, and ethylene on a nickel surface, the diffusion of hydrogen through palladium, the reduction of copper oxide and the establishment of the equilibrium $H_2 + D_2 \rightleftarrows 2HD$. The separation of the two isotopes does not occur in every one of these reactions, but in those cases where it is effected, the difference in velocities can, in general, be explained by the collision and zero point energy factors.

Molecular Physics

Discussing the importance of heavy hydrogen in molecular physics, Mr. G. B. B. M. Sutherland said one of the outstanding problems in present-day molecular physics is that of determining the exact nature of the force field which exists between the various atoms of a polyatomic molecule. It may be approached in two ways. From our knowledge of the electronic structure of the separate atoms, we may, by using the methods of quantum mechanics, attempt to compute the interatomic force field. The mathematical difficulties are, however, so great that this method is necessarily limited to a very few of the simplest molecules. Alternatively we may relate the constants determining the force field to the fundamental vibration frequencies of the molecule, as determined from infra-red and Raman spectra. It happens, however, that in general there are more arbitrary constants in the potential function than there are frequencies by which to determine them, so that one has to make some special assumption regarding the nature of the force field in order to reduce the number of arbitrary constants to be less than, or equal to, the number of fundamental frequencies. The importance of the new isotope lies in the fact that (for molecules containing hydrogen) we may replace a hydrogen atom by a diplogen one and so obtain a new set of frequencies which are still however related to the same set of force constants. It is therefore possible to obtain the force constants in the most general type of potential function without making those specific and rather doubtful assumptions which have hitherto been necessary.

The structure of water and of ice has long been a matter of controversy in molecular physics. The advent of heavy water with its characteristically different physical properties should prove a touchstone whereby any theory of the structure of ordinary water and ice may stand or fall, since any complete theory of the structure of ordinary water should enable one to predict the properties of the heavy water.

A Study of Chemical Reactions

Dr. L. FARKAS, who spoke of some chemical reactions of heavy hydrogen, pointed out that the interaction $D_2 + H_2O$ takes place in the gas phase above 500° C., the mechanism being in principle similar to that of the $H_2 + D_2$ reaction. From catalytic experiments it was found that the equilibrium constant of the reaction $H_2O + HD = HOD + H_2$ is 3.8 at 20° and 1.8 at 100° C. It is pointed out that this equilibrium reaction may play an important rôle in the electrolytic separation of the hydrogen isotopes. The same applies also to the separation observed in dissolving metals in water or in acids in presence of heavy water. In the case of the photochemical hydrogen-chlorine reaction it is shown that the heavy hydrogen reacts slower than the light, since its activation energy for the first step of this chain reaction is larger owing to its smaller zero-point energy. In collaboration with Professor Rideal, Dr. Farkas has found that in the catalytic interaction of heavy hydrogen and ethylene two reactions take place simultaneously but independently: the addition of hydrogen and the exchange of hydrogen. With Mr. Yudkin he has investigated the enzymatic decomposition of sodium formate in presence of heavy water by *B. coli*. The hydrogen evolved is in equilibrium with the water, and also the interaction $H_2O + HD = HOD + H_2$ is readily catalysed by the bacteria.

Adsorption of Gaseous Isotopes

The final contribution to the discussion came from Mr. C. Strachan, who dealt with the adsorption of gaseous isotopes. The possible energy states of an atom or molecule adsorbed on the surface of a solid have been considered by the methods of wave mechanics. The solid is treated as in the theory of specific heats developed by Born, Debye and others. The adatom is supposed held by forces giving a potential energy which varies with distance from the surface. Under the influence of the heat motion of the solid the adatom can take up states of different energy in this potential energy trough and can perhaps evaporate from the surface. A knowledge of heat of adsorption, difference of zero-point energy for isotopes, and results from adsorption isothermals can give quantitative information about the parameters involved in the description of the above potential energy curve. The analysis then allows the evaluation of (1) average time intervals between transitions of adatoms from "bound" states to states when surface migration is possible; (2) probability of evaporation; and (3) length of life of adatom in "migratory" state, together with their dependence on temperature and the differences of behaviour of isotopes. In particular, results are obtained for hydrogen (H and D) adsorbed on copper and palladium, and conclusions are drawn about the mechanism of evaporation of hydrogen from a state of adsorption in atomatic form.

On Tuesday there was another joint discussion, in this case with the Agriculture Section, the subject being "The Chemistry of Milk."

Following an introduction by Professor H. D. Kay, Dr. J. F. Tocher dealt with the composition of milk and the present regulations, and also with variations in the freezing point of milk. The proportions of the constituents of milk, he said, are known to vary widely from sample to sample even in the case of bulked milk. In 1925 he described the form of variation for each constituent. In the case of fat and solids-not-fat percentages, it was shown that many cases occurred where the values fell below the prescribed presumptive limits under the regulations. These regulations were made at a time when no accurate knowledge existed of the observed minimum limits in the case of herds. Legal enactments, however, should follow scientific knowledge, not precede it. One of the difficulties encountered is a method of detecting "watering." Many cases have occurred where *genuine* milk has been held to be watered. An equation has been found from which it is possible to detect watering within certain limits, which can be used in conjunction with the observed freezing point. The results will be published at an early date, together with the freezing point results obtained from the same samples.

Freezing Point of Milk

It has been found by various workers that there is very little variation in the freezing point of milk, even if samples are taken from individual cows. It is the least variable of all the physical characters, the coefficient of variation being approximately 1.5 as against 4.5 for refractive index and 5 for specific gravity. On account of its low variability the freezing point of milk has been frequently used as a criterion of "watering." No general agreement has, however, been reached as to the actual range of values in genuine samples. Different results have been obtained from the same sample, due chiefly to the practice of placing alcohol between the freezing tube and the ether flask. In one case the alcohol is removed after cooling, while in the other it is retained. Much more constant and accurate results are obtained by removing the alcohol, which is useful only to promote rapid cooling. In 1925, Dr. Tocher showed that, in the absence of alcohol, the values varied from −0.50° C. to −0.56° C. in fresh samples from individual cows. Certain workers hold that if the freezing point of a sample is greater than −0.52° C., water has been added. Before, however, one can estimate whether watering has taken place one must know the number of cows whose milk has been bulked. Variation in bulked samples is naturally greater than in samples from one cow. Values of −0.50° C. have been obtained from the bulked fresh milk of a herd. On that account it would be difficult to say whether milk has been watered if values in the neighbourhood of −0.50° C. were obtained.

Properties of Casein

Dr. K. LINDERSTROM-LANG discussed some chemical and physical properties of casein. He pointed out that casein (caseinogen), the phosphor protein in milk, is a mixture of two or more substances. By treatment with acid alcohol it may be divided into several fractions that differ in chemical comopsition, especially in their content of phosphorus. Mixing the fractions in their original proportions gives the original casein with its characteristic physical and chemical properties. Investigations of the solubility of casein in acids and bases show its complex nature. The solubility is, under constant conditions, a function of the amount of casein present as precipitate, and the dissolved substances differ in chemical compositions from the precipitate. The fact that casein is a mixture makes investigation of its chemical structure difficult. Due to its high content of phosphorus and the importance of this to nutrition problems, the mode of combination of this element has been the subject for elaborate studies. Experiments show that the phosphorus in casein is present as phosphoric acid and—at least partly—bound to serine by an ester linkage. As the phosphorus content of the different fractions of casein is different, this problem is of importance to the explanation of the above-named physical properties.

The composition of milk-fat was then dealt with by Professor T. P. Hilditch. The methods available for the rapid characterisation and routine analysis of milk-fats are insufficient to give detailed information as to the fatty acids and glyserides present therein. The present knowledge of milk-fat acids and glycerides, and of the procedures adopted in their study, were briefly summarised. The available data permit some comparisons to be made between the milk-fats of cows and of other animals, and also suggest some of the ways in which the milk-fat components may be varied as a result of change in the diet of the animal, in its age, or in certain other factors. Certain acids (*e.g.,* butyric, caproic, palmitic, stearic, oleic) are present in important proportions in milk-fats, whilst others (some of which may be peculiar to milk-fats) are present in minute proportions. The recent work of Brown and others on some of the latter acids is described. There is at the moment some uncertainty as to the presence of linoleic or other polyethenoid acids of the C_{18} series in butter fat.

Vitamins in Milk

Dr. S. K. KON, who spoke about the vitamins of milk, stated that a study of the vitamin content of milk produced under conditions typical of the South of England practice has been in progress for the last three years at the National Institute for Research in Dairying, Reading. Biological tests have demonstrated marked seasonal variations in the total vitamin A activity and in the vitamin D content of milk. Physical measurements show a similar fluctuation in the carotene content. The concentrations of the vitamin B complex, vitamin B_1 and vitamin B_2 appear to be constant throughout the year and are not affected by the season. The amounts of vitamin A, B_1 and D present in milk at different seasons of the year are given in terms of the respective International Standards. It has been shown in joint work with Drs. Moore and Dann, of Cambridge, that the $SbCl_3$ test for vitamin A cannot be applied directly to butter owing to the presence in the latter of an inhibitor showing seasonal variation. The inhibitor is removed by saponification. The total vitamin A activities of Shorthorn and Guernsey butters produced under identical conditions of feeding and management are equal. On the other hand, Shorthorn butter contains more vitamin A and less carotene than a corresponding Guernsey butter.

When the chemical test for vitamin C (using the 2-6-dichlorophenol-indophenol reagent) is applied to bottled milk, marked day to day variations are noticed in the concentration of the reducing factor. These are due to the action of light transmitted through glass bottles. Vitamin C in milk is either rapidly destroyed by visible light or else it undergoes reversible oxidation, the product reacting no more with the vitamin C reagent. The vitamin D activity of butters is to a large extent lost after saponification, under conditions in which the antirachitic factors of cod-liver oil and irradiated ergosterol are unaffected (experiments on rats). The loss in activity is more marked in autumn and winter butters than in summer butters.

Slums and Smoke Prevention

National Smoke Abatement Conference

THE creation of new slum areas by smoke polluted atmosphere is to receive special consideration at the annual conference of the National Smoke Abatement Society at Glasgow, September 27-29. Dr. J. Johnstone Jervis, Medical Officer of Health for Leeds, will be the chief speaker on the subject of slum clearance and smoke prevention and the representatives of numerous local authorities who will attend will pool their experiences.

Dr. J. S. Owens, who is in charge of the investigations into atmospheric pollution on behalf of the Department of Scientific and Industrial Research, and has invented many of the delicate instruments used for the measurement of atmospheric pollution, is to describe the latest developments in this direction. New instruments for the measurement of smoke emission will also be demonstrated. Special consideration is also to be given by the conference to the effects of smoke upon visibility and aviation, and upon horticulture.

The delegates to the conference will be given a civic reception by the Lord Provost in the City Chambers and the discussions will take place in the Council Hall. The chairmen at the various sessions will include Dr. H. A. des Voeux, president of the Society, and Dr. John R. Currie, professor of Public Health at Glasgow University.

Kippers, Halibut, Beef and Apples

Sir Frank Smith delivers the Hardy Memorial Lecture at the British Association Meeting

SIR FRANK SMITH, Secretary of the Department of Scientific and Industrial Research, who delivered the Hardy Memorial Lecture on "Transport and Storage of Food" to the British Association on September 7, paid a glowing tribute to the work done on behalf of the Department by Sir William Hardy during the last 17 years of his life in research on the transport and storage of foodstuffs. He described how the work of the Department's Torry Research Station at Aberdeen, founded by Sir William Hardy, was likely to help the fishing industry to return to prosperity. He also reminded his audience that the recent report of the Sea Fish Commission had stressed the highly perishable nature of the herring. Herrings caught more than 24 hours before landing are known in the trade as "overdays" and are inferior in quality. This fact led to the importance to the industry of kippering, and partly explained why the kipper was the most popular form of herring with a large part of the public.

Work at the Torry Research Station

The final condition of the fish, continued Sir Frank, must depend not only on the antiseptic substances in the smoke, but on the range of temperature and the dampness of the drying atmosphere. At the Torry Research Station each of these variables had been separately investigated and a new type of smoking kiln evolved in which all were under complete control. The new kiln is heated by electricity or gas, and the smoke is made by burning sawdust in a box external to the kiln. The rate of burning is governed by a small electric blower, and the amount of smoke is adjusted to the required degree before entering the kiln. Fans are fitted in the kiln to give even smoking. With this plant any desired cure could be produced with certainty, and no matter what the external conditions might be it was easy to secure evenness of cure, brilliance of colour, cleanliness, and the excellency of flavour on which the quality of the finished kipper depended. In another direction, by combining the processes of salting and chilling, a mild salted herring had been produced at Torry which was likely to appeal to the popular palate. This it was hoped might assist in restoring the salt cured herring to favour in the home market, and thereby do something to replace the lost export trade in salted herrings which has now dropped to four million cwts. a year as against over six and a half million cwts. in 1913

The White Fish Industry

Turning to the white fish industry—cod, halibut, plaice, etc.—Sir Frank said that home waters were unable to cope with the demands of the market for good fish, and larger vessels, having a greater and greater range, had had to be built. There were now about 1,600 steam trawlers fishing from our ports, and they landed nearly seven hundred thousand tons of white fish, worth about twelve and a half million pounds, a year. Though there was a very good market for fresh fish, far too large a proportion of the fish landed was stale. The usual treatment of stowage in crushed ice under the conditions prevailing when Hardy took up the problem in 1929, could only hold fish fresh for six to seven days. The workers at the Torry Research Station had found, however, by experiments under ordinary sea-going conditions, that this period could be extended to twelve days by taking reasonable care to reduce bacterial contamination of the fish on board the trawler.

Nevertheless, about one-third of our trawlers are making trips for fourteen days in duration, while trips of 24 days, of which 14 days were taken in steaming to the fishing ground and returning were common. In such cases the earliest fish caught would be 17 days old and the latest 7 days old on landing. Mere chilling in clean ice is clearly not sufficient, but research has found a possible solution in freezing in cold brine at $-20°$ C. It is not until this low temperature is reached, a temperature incidentally at which the growth of bacteria is completely arrested, that a sufficiently rapid rate of freezing results. To preserve the high quality the minute ice crystals formed must not be allowed to grow too large and disintegrate the flesh, and this necessitates storing the frozen product at the same low temperature. If that be done fish can be stored for three months, and on thawing it has been found as good to look at and to eat as if it had just come out of the sea.

Sir Frank then referred to the enterprise which had fitted out a 10,000 ton vessel, the "Arctic Queen," as a floating factory ship for halibut. This great vessel is fitted with plant for brine freezing and it can store at $-20°$ C. no less than four thousand tons of halibut at the rate of seventy tons a day. In May she goes as far afield as the Davis Straits, off the coast of Greenland, where the fish are caught, and at the end of the season, in October, she returns to Hull, and there acts as a floating cold store discharging her fish according to the needs of the market. In addition to her main task of brine freezing and storing halibut, the "Arctic Queen" freezes and salts a certain amount of cod, manufactures cod liver oil, and freezes and stores the halibut livers which yield oil far richer medicinally than that of the cod but which demand a different process of extraction and one not so suitable for operation at sea.

Food from Overseas

To-day about one million pounds of the money of this country is spent on an average every day on food brought from overseas. During 1932 imported meat alone was valued at over £78,000,000. Of eggs we imported about two thousand million, and of apples about three thousand millions a year. Seventy years ago no one had tasted lamb from New Zealand. The reason was simple—it could not be transported and remain fit as food.

Cold is the best of all preservatives, and to-day practically all cold used for preserving food is artificially produced. The achievement of the refrigerating engineer during the past fifty years can only be described as prodigious. Whereas 60 years ago there was no refrigerating machine and no cold storage space provided in ships, to-day the refrigerated space used in bringing foodstuffs overseas to this country alone amounts to not less than one hundred million cubic feet, equivalent to a floating cold store 20 ft. high, 50 ft. wide and 20 miles long. The capacity of the public cold stores in Great Britain amounts to about half of this, while our annual output of artificial ice is one and a quarter million tons, of which the fishing industry uses three-quarters of a million tons.

Lopsided Development

Seventeen years ago when Hardy took up his great work on food research he found that great as they had been, the developments of food preservation had been lopsided. On the physical and mechanical sides the development had been at a rapid rate, but on the biological side the advance had been slow. The proper order of things was for the biologist to formulate the conditions required for the satisfactory storage of various forms of foodstuffs and for the engineer to provide these conditions. To-day, thanks largely to the work of Sir William Hardy, this condition of things was beginning to be realised. In the case of meat, deterioration was due to two main causes, first the self-induced deterioration of meat through "enzymes" or organisms naturally present in the meat itself, and second the growth of micro-organisms chiefly mould and bacteria. The first form of deterioration could be completely prevented by cold. Even with storage at 0° C. it could be negligible for six months and practically made to cease altogether by storage at $-10°$ C. In the case of bacteria, however, the time meat could be kept edible depended on the initial contamination to which the meat had been exposed. Meat was unsaleable if the bacterial population reached a density of over 30 million organisms per square centimetre. If the initial bacterial load

is 100,000 per square centimetre this critical density is reached in seven days if the meat is stored at 0° C. and 100 per cent. humidity, but if the initial load is only 10 per square centimetre, the storage life could be more than doubled.

At first sight it would appear that the application of cold at – 10° C. would give a solution for the storage problems of meat. Unfortunately freezing itself produced changes which were liable to damage the meat. This damage is negligible in the case of mutton, lamb and pork, but makes freezing as distinct from chilling unsatisfactory for beef. One effect of freezing is similar to that of drying, for both remove water, but whereas in drying the water is entirely removed, in freezing it remains in the tissue in the form of ice, and is thus free to be reabsorbed when the tissues are thawed. The proportion of water frozen out of the tissues depends on the temperature. In the case of muscle it is about 17 per cent. at a temperature of – 1° C. and about 98 per cent. at a temperature of – 20° C. The ice is in the form of crystals, and the size of the crystals depends not on the temperature alone, but more particularly on the rate of freezing. When meat is frozen slowly the bulk of the ice is formed between the muscle fibres and the crystals are large, such crystals have a disruptive effect upon the fibres, and the result is that when the meat is thawed the water is not entirely reabsorbed but partly drains away carrying with it dissolved protein, salts and pigments. This is unsatisfactory.

Micro-organisms in Beef

Accordingly other methods than cold alone to prevent the growth of micro-organisms in beef and so extend the period it can be carried in chill have been sought. A reduction in the humidity of the holds of ships would be one method, Sir Frank said, but if humidity is low, loss of weight by evaporation may be considerable. It appears likely, however, that a solution which would allow beef to be held in chill long enough to be carried from Australia and New Zealand has been found at the Department's Low Temperature Research Station at Cambridge. It so happens that the most important micro-organisms attacking meat, both bacteria and moulds, are specially susceptible to carbon dioxide and that, at temperatures in the region of the freezing point, a concentration of 10 to 20 per cent. of this gas so delays their growth as to double the life of the beef. The laboratory experiments which led to this discovery have been fully verified by large scale experiments at sea, and the early historic shipments of meat under refrigeration in the 19th century had their counterpart last year when a shipment of chilled beef was made from New Zealand. It was, he said, the first consignment of chilled beef to be carried overseas in gas storage. A fine new twin-screw motor ship, the "Port Chalmers," specially designed for this new trade, left London on her maiden voyage to New Zealand last January. On board her, carbon dioxide is carried in 160 specially designed steel bottles.

Turning to fruit, Sir Frank said that when Hardy and those associated with him started their research on fruit, they started in the belief that an intensive study of one fruit would reveal facts applicable to all, and the fruit chosen for the first experiments was the apple. They realised afterwards that they were far too optimistic, for even one type of fruit like the apple reveals idiosyncrasies to the point of absurdity. Nevertheless, a concentrated study of a single fruit like the apple, of which we consume about 6,000 million every year, was well worth while.

Gas Storage of Apples

Sir Frank then described how, when the process of ripening is retarded by cooling or in some other way, chemical changes are apt not only to be slowed down but to depart somewhat from the normal, with the result that abnormal products may be formed which, among other things, may alter the flavour of the apple. He also referred to the way in which apples varied in their tolerance for cold, and showed that it was largely the British apple's intolerance for cold which accounted for the fact that for about nine months of the year our table apples came from overseas, although some of these were gathered at the same time as our homegrown apples. The work of Sir William Hardy had found a solution for this problem by means of a new method known as "gas-storage," in which the life of the stored apple was slowed down by increasing the percentage of carbon dioxide in the atmosphere of the store to a particular amount while the temperature of the store was maintained well above freezing point. This discovery had opened a new era in the storage of English apples, and English growers had not been slow to take advantage of it.

Helium in Natural Gas

Improved Apparatus for Rapid Determination

AN improved apparatus and method for the rapid and accurate determination of the helium content of natural gas and gaseous mixtures derived from that source have been developed in the Cryogenic Laboratory of the United States Bureau of Mines. These improvements are the result of technical investigations which are a part of the Bureau's helium programme, directed toward reducing costs of supplying all of this non-combustible gas used in the lighter-than-air-craft of the Army and Navy, and toward assuring adequate supplies of this phenomenal war mineral.

The quantitative determination of helium in a gaseous mixture is accomplished by the removal of the other constituents from the sample, either by chemical or physical means, leaving only the helium which can be measured directly. Chemical methods, when applied to natural gas, require the burning of the hydrocarbons in oxygen, the absorption of the resulting carbon dioxide in a caustic solution, the removal of the excess oxygen in a suitable solution such as an alkaline pyrogallate, and the elimination of nitrogen by sparking or by combination with hot calcium or magnesium. Such procedures are very slow and tedious compared with the physical method which employs selective absorption by activated charcoal to separate the other constituents from the helium. When cooled to liquid-air temperatures, activated coconut charcoal absorbs large volumes of the principal constituents of natural gas, such as nitrogen, methane, other gases of the hydrocarbon series, carbon dioxide, and oxygen, if the latter is present in the sample, but does not absorb detectable quantities of helium, under the conditions prevailing in the analytical apparatus. In natural gases hydrogen and neon are either absent or occur in percentages as to be absorbed readily by the charcoal employed.

Essentially, the apparatus consists of a condensation tube, two charcoal tubes, a Töpler mercury pump, and a burette. All of these parts and the necessary mercury traps, stop-cocks, and manometer are welded together, forming a vacuum-tight apparatus. Accessory equipment includes a spectroscope, spark coil, 6-volt storage battery, a balance for weighing, a gasometer or equivalent for holding the sample before analysis, vacuum flasks for holding liquid air, and pumps or other devices for supplying compressed air and creating a vacuum to operate the Töpler mercury pump. After becoming familiar with the apparatus, an analyst can complete determinations in 15 to 30 minutes, depending upon the volume of helium to be pumped out of the apparatus, and with ordinary care results can be duplicated within close ranges. For samples having 1 per cent. or less of helium, check determinations should not vary more than 0.01 per cent. Check results for samples having from 1 to 2 per cent. helium should be within ±0.01 per cent.

Copies of "An Apparatus and Method for the Determination of Helium in Natural Gas" (I.C. 6706) may be obtained without charge upon request to the Information Division, United States Bureau of Mines, Washington, D.C.

The Classification of Chemical Trade Purchases

Modern Methods of Analysis and Recording

By S. HOWARD WITHEY, F.C.I.

CHEMICAL trade purchases usually consist of both cash purchases and credit purchases, that is to say certain materials are paid for at the time of placing the orders, while other stores are bought subject to payment at a future date, the ratio which these bear to the total purchases varying according to the class of trade, and the nature of the product or products manufactured. If no analysis of the transactions is considered necessary or desirable, both cash and credit purchases will appear under the same heading in the final account, but if separate goods or stock accounts are kept, the original entries will have to be systematically dissected, which means that the method of analysing the credit purchases will not be the same as that adopted for recording the cash transactions.

When pastes and paints, acids and solvents, tar and disinfecting fluids, or any other materials or stores, are bought on a cash basis, the purchaser's stock will be increased and his cash or bank balance correspondingly reduced. Consequently, to give proper effect to such transactions in the books of account, the cash book should be credited with the value going out, and the specific stock accounts debited with the value coming in. On the other hand, the credit purchases, while also increasing the purchaser's stock, will create various trading liabilities, calling for the debiting of the particular trading accounts and the crediting of the accounts of the different suppliers.

The Purchases Account

In practice, it is not possible, neither is it necessary, to debit each stock account with every consignment received at the works. Indeed, the purchases accounts can be charged much more effectively by grouping the materials and stores under definite headings, and by using a pattern of purchases journal, or bought day book, which has been provided by the printers with a sufficient number of extra money columns to enable each item to be suitably classified when the original entry is made. The grouping of materials will naturally differ at each works, but a few typical headings are enumerated below :—

Pastes, paints and compositions.
Acids and alkalis.
Benzol and other solvents.
Tar, naphtha, pitch, etc.
Rubber chemicals and pigments.
Analytical and research chemicals.
Hampers, cases and boxes.
Barrels, drums and cans.

The records of credit purchases should be made from the particulars shown on the different invoices rendered by the suppliers or purchasing agents, the invoices and the associated debiting documents having first been checked in detail, compared with the particulars enumerated on the carbon copies of the original orders, and passed for payment. Each entry should give the date and number of the invoice, the name of the manufacturer or distributor, and a brief description of the materials or stores received, the net invoiced cost price being inserted in the " Total " column, and the amount at once extended under its most appropriate analytical heading. In those instances where more than one kind or description of materials is shown on the same invoice, the total cost will have to be dissected for the purpose of determining the precise figures to be set down in two or more columns, the clerical accuracy of the records being verified at the foot of each page, also at the end of the month, by seeing that the totals of the various analytical columns agree, when added together, with the figure shown in the " Total " column. Care must be exercised to ensure that the total cost is credited to the proper personal account, and that the monthly or other periodical totals of each classification column are transferred to the debit side of the correct accounts in the impersonal ledger, thereby completing the essential double-entry.

The Guard Book Method

The manufacturer who obtains his supplies regularly from the same source, and who deals with only a few suppliers, may adopt what is known as the Guard Book method of recording the trade purchases, and so reduce the volume of clerical work to a minimum. After all the details have been carefully checked, the invoices will then be folded and endorsed with the date, the supplier's name, and the amount, and afterwards pasted into a book made of thick paper or cardboard, the cost prices being immediately inserted in a cash column ruled down the right-hand margin, from where the amounts can be posted to the respective personal accounts. The main disadvantages associated with this method are that the book soon becomes difficult to handle, owing to its bulk, and that a sub-division of the operations is practically impossible. Alternatively, all invoices and credit notes received from the same supplier can be pinned together or otherwise attached to await the monthly statements of account, a list of outstanding balances being made out at the close of each month's work, and the total of these balances recorded on the credit side of a " Sundry Creditors' Account." Each payment made in settlement, or part settlement, of any of these accounts would then have to be posted from the credit side of the general cash book, or from the cash payments book, as the case may be, direct to the debit side of " Sundry Creditors' Account," the balance of which would correspond with the total of the unpaid bills on the file. Generally speaking, it is better to keep an analytical purchases journal, a good general ruling for which is indicated below.

Capital Outlay

At the end of the purchases journal, a few pages should be reserved for recording the value of returns outwards, including allowances made by suppliers in lieu of actual returns, these items being classified under the same headings

EXAMPLE I.—CHEMICAL TRADE PURCHASES JOURNAL.

Date.	*Invoice No.*	*Name of Supplier.*	*Details.*	*Ledger Folio.*	*Total.*	*Tubes (Copper, Brass, Phos-Bronze).*	*Charcoal and Lime.*	*Cement and Tiles.*	*Acids.*	*Power, Lighting and Heating.*	*Grinding.*	*Sundries.*	*Capital Outlay.*

as the original purchase transactions, and the totals of the different columns deducted from the purchases totals before the latter are transferred to the ledger. The total of the "Capital Outlay" column will need further dissection for the purpose of ascertaining the amount to be debited to each asset account, this column being used for showing the capital cost of recovery and distillation plant, furnaces, driers, glass-blowing apparatus, presses and pumps, recording instruments, and weights and balances, etc.

Where possible, the purchases ledger should be kept on the self-balancing principle, enabling the clerical accuracy of the entries to be proved independently of any other ledger. To do this, the entries made in the subsidiary books, viz.:—the cash book, purchases book, sales book, and credit book, should be analysed to show the totals of the items which have been posted to the purchases ledger, a reconciliation account being prepared at the end of every month, in which the totals should be arranged as shown in Example 2.

References to the accounts of suppliers can be very materially facilitated by indexing the ledger on the vowel system, whereby each account is indexed under the initial letter of the surname, and in the section corresponding to the first vowel following the initial letter. An illustration of the vowel index method is given in Example 3.

Invoices and other documents supporting the entries made in the purchases journal should be filed away in strict consecutive order, a separate file being used for the preservation of credit notes.

EXAMPLE 2.—PURCHASES LEDGER RECONCILIATION ACCOUNT.

DEBIT.				31ST AUGUST, 1934.				CREDIT.
To Cash Paid in Settlement or Part Settlement of outstanding Accounts, as per Cash Book ..	605	11	2	By Amount owing to Suppliers and Trade Creditors as at Commencement of Month	568	17	9	
,, Discounts obtained, as per Cash Book ..	12	3	9	,, Total Purchases during Month, as per Purchases Journal	611	4	3	
,, Returns Outwards and Allowances, as per End Section of Purchases Journal	21	7	6	,, Transfers from other Ledgers, as per Transfer Journal	15	3	7	
,, Bills Payable, as per Bill Book	50	0	0					
,, Transfers, as per Transfer Journal	3	6	8					
,, Balance, being Amount owing to Suppliers and Trade Creditors as at End of Month ..	502	16	6					
£	1,195	5	7	£	1,195	5	7	

EXAMPLE 3.—VOWEL INDEXING.

	a	*e*	*i*	*o*	*u*
A	Adlam (Geo.) & Sons, Ltd. .. ..167 Alfa Laval Co., Ltd. 203	Alexander, Fergusson & Co., Ltd. .. .. 81 Appleton & Howard, Ltd. 114	Albright, T. .. 81 Atkinson (J. & E.), Ltd. 215	Alcock (Peroxide), Ltd. .. .. 22 Associated Dyers & Cleaners, Ltd. ..152	Aluminium Plant & Vessel Co., Ltd. .. 48 Arbut, S. R. .. 90
B	Barter Trading Corpn., Ltd. .. ..107 Barronia Metals, Ltd. 286	Bellamy (John), Ltd. .. ..256 Bennett, Heyde (J.) & Co. 261	Bideford Black, Ltd. 88 British Industrial Solvents, Ltd. ..222	Brough (E. A.) & Co., Ltd. .. ..117 Brown & Forth, Ltd. 200	Blundell, Spence & Co., Ltd. .. 66 Burgess, E. .. 109
C	Callow Rock Lime Co., Ltd. .. .. 13 Carty & Sons, Ltd. 283	Central Pulverizing Co., Ltd. .. ..191 Chemical & Metallurgical Corpn., Ltd. 217	Clifford (Charles) & Son, Ltd. .. .. 77 Crighton, W. ..184	Copes Regulators, Ltd. .. .. 98 Cory (Horace) & Co., Ltd. 229	Crump & Co. .. 126 Curdwork Chemical Co. 184
D	Dalheim, T. G. .. 71 Dawes (S. T.) & Co., Ltd. 300	Dent, R. S. .. .. 55 Dexine, Ltd. ..203	Dick (R. & J.), Ltd. 128 Drinkwater Bros. ..185	Dorr-Oliver Co., Ltd. .. ..120 Doulton & Co., Ltd. 229	Dublin & Wicklow Manure Co., Ltd. 37 Dunkley (W.) & Co. 306

Increased German Benzol Output

FOLLOWING the upward trend developing in 1933 for the first time since the advent of the depression, German output of benzol continued to expand this year, showing an increase of around 17 per cent. in the first quarter over the corresponding period of 1933. Total output for all 1933 showed an increase of almost 13 per cent. to 255,000 tons from 230,000 in 1932. Owing to the active demand for benzol for motor fuel purposes in Germany, no difficulty is being encountered in disposing of the increased production. Imports of benzol also expanded moderately this year, rising by less than 10 per cent. in the first quarter to 17,087 metric tons, from 15,806 tons in the parallel period last year.

Calcium Carbide Production in Chile

THE larger of two projects for the manufacture of calcium carbide in Chile calls for a capital investment of 15,000,000 pesos for construction of a hydro-electric plant and a calcium-carbide factory in the south of Chile. Output is estimated to be 6,000 tons annually. There seems to be no probability of an immediate realisation of this project. The second, however, which actually indicates eventual realisation, calls for an expenditure of 8,000,000 to 10,000,000 pesos, the major part of which is to be used in the purchase of electrical machinery. Planned output will be 3,000 tons of carbide annually. The average annual consumption of calcium carbide in Chile is estimated at 6,000 tons.

The Training of Industrial Chemists

Mr. W. Rintoul Outlines the Ideal Preparation for a Successful Career

IN connection with the meetings of the British Association which were terminated at Aberdeen this week, there was a joint meeting of Sections L (Educational Science) and F (Economic Science and Statistics: Department of Industrial Co-operation) on Tuesday, September 11, for a general discussion on the planning of a national policy of technical education and industrial recruitment. Mr. W. Rintoul, of Imperial Chemical Industries, Ltd., outlined a policy of education as applied to the training of industrial chemists.

Mr. Rintoul said that a concise description of the term "industrial chemist" was hardly possible. All that could be attempted was to arrive at a rather broad classification on some such lines as the following: (1) the analyst, (2) the chemist engaged in control of plant and manufacture, (3) the research chemist, and (4) the commercial chemist attached to the business side of industry. These terms were, of course, not mutually exclusive and each was capable of further subdivision, but they served as indicating the types of chemists on whose training he was discussing.

A Debatable Question

He emphasised strongly that it was essential that, in addition to a good general education, there should be imposed first of all a thorough training in the science of chemistry, if possible up to the standard of an honours B.Sc. degree. Then came the more debatable question of the direction and degree of specialisation which was advisable. Specialisation in a narrow field should be avoided as it might lead to years of waiting for a suitable opening in the field selected. At this stage in his training the individual would often have developed a taste for some particular line of work and, if so, this was undoubtedly the line he should follow as it generally happened that one did his best work in the field that had the greatest attraction for him.

Discussing the question under the four headings enumerated, Mr. Rintoul said that while the function of the analyst was an extremely important and necessary one in industry, it was exceptional for a chemist to limit himself to this field alone. He generally either added other duties to those of the analyst or found himself transferred to some other branch. Very often, through the close contact which he ought to have with manufacturing products, he passed over into the second category and became a plant chemist, or else transferred to some other branch of the industry for which he had developed a special aptitude. With this possibility in view, the individual who wished to specialise as an analyst should not limit his post-graduate work to this field alone, but should include in it either a training in methods of research in general, or in the much discussed subject, chemical engineering, or in some other subject likely to be of use to him.

The Plant Chemist

The post-graduate training of the plant chemist was all important if he was to develop to his maximum, and yet it did not matter much what branch of the science he chose for this work. Perhaps a training in research methods for one or preferably two years was as good as any other in some cases. In others, the same time spent in the study of chemical engineering might ultimately prove more useful. What did matter in all cases, however, were the conditions under which this post-graduate work was carried out. It was most necessary that chemists belonging to this category should have their outlook on life widened as much as possible and their corners well rounded off. No matter what university he had been trained in so far, if he had done his job there his life had to some extent been monastic and a corrective was necessary. He must now learn how to live. Therefore, Mr. Rintoul advocated that the post-graduate work should be carried out in a university other than the one in which the individual had qualified, preferably in one where the general conditions of life were as different as possible from those to which he had been accustomed. This, of course, pointed to a foreign university and preferably in a country where English was not the spoken language. This, of course, did not entirely exclude American universities, added Mr. Rintoul. He did not think he was entirely heretical when he suggested that at this period of training, what the chemist learned outside his university was of more importance to him that what he was taught in its laboratories and lecture rooms.

Having completed his post-graduate training of two years on whatever lines he had chosen, the chemist should now be in a position to apply for and accept an industrial position. At the same time it must be remembered that his training was by no means yet complete. He had still to learn all about the organisation and working of the industry in which he found himself before he could ascertain for himself, or be guided to, the means by which he could apply the knowledge he had acquired to the best service of this industry. When he had become familiar with all sides of this part of the work it was time enough for him to be transferred to some manufacturing plant or process, and given charge of an actual manufacturing operation. Here he would come in contact with the workers employed and would find it necessary to solve many kinds of problems other than chemical ones.

The Research Chemist

Coming to the research chemist, Mr. Rintoul remarked that the training of a research chemist might be rather a controversial subject and it certainly was one on which it was very difficult to generalise. Perhaps that was just as well because originality was the soul of research and it was unthinkable that all research workers should be trained on stereotyped lines. This was clearly a case in which standardisation must be avoided at all costs.

It was even more necessary in the case of a research chemist that his postgraduate work should be undertaken at a university other than his own, than in the case of the plant chemist, but for a somewhat different reason. The superintending plant chemist must be a man of the world capable of handling problems other than merely chemical ones. This was not so essential in the case of the research chemist although if he had that quality also, so much the better. The objection to his completing his course in his original university was that by doing so he lacked the experience and breadth of training he would acquire by running up against, and exchanging ideas with, men trained in other spheres. A change of environment was essential, otherwise he might not attain the highest degree of originality of which he was capable.

The Commercial Chemist

Finally, dealing with the commercial chemist, Mr. Rintoul said that although men in this category had long been known, especially in Germany and America, they were only now beginning to be made use of in this country and no adequate steps had been taken to devise a course of training which would produce men particularly suitable for this work. Broadly speaking, the training of the commercial chemist should be on lines similar to those of the previous three categories mentioned, but he need not necessarily have the highest scientific or technical qualifications. He should, however, have a broad technical knowledge, good ability, commercial instinct, some experience abroad and should be a good mixer. Possibly the best way at present for the industry interested would be to appoint men to their staffs when they had reached a degree standard of training, and second them for further training under the direction of the heads of the commercial departments. The use by industry of technical men trained in this way was likely to increase very considerably.

Summarising, Mr. Rintoul said that the ideal preparation for the career of the industrial chemist would be a good general education, and an Honours B.Sc. Degree in pure science, followed by two years' specialisation on one or other of the lines which he had mentioned depending upon the circumstances and tastes of the individual.

Hazards in Handling Dangerous Goods

The Annual Report of H.M. Inspectors of Explosives for 1933 gives Details of Some Unusual Cases

NO serious irregularity in connection with the manufacture or storage of explosives in factories licensed by the Home Office came to the notice of H.M. Inspectors of Explosives during 1933, according to the annual report just issued (H.M. Stationery Office, 1s. net). Accidents in manufacture, which included many quite trivial though reportable accidents, was small compared with the large quantities of explosives produced. Of the two fatal accidents one occurred in a firework factory, and attention is called to the needlessly sensitive compositions sometimes used in firework manufacture. The other accident in an ammunition factory occurred when destroying waste explosives. The new and more stringent conditions imposed in August, 1932, under Section 56 of the Explosives Act, on firework manufacturers when using aluminium compositions have worked satisfactorily.

The Chief Faults

As many opportunities as possible were taken to visit stores and registered premises, with the appointed officer. Visits were made chiefly to the industrial districts, and, whilst in many cases the stores and registered premises were in a satisfactory state, many were not. The chief faults were insecurity, storage of detonators with explosives, and stores being in a dirty and gritty state. In addition, there were many stores where the requisite notices under Order in Council No. 6 and Section 25 of the Explosives Act were not posted. These notices are important if for no other reason than safeguarding the interest of the licensee.

The advance made in the design of light diesel engines has led to an application for some relaxation of the "conditions" imposed by the Secretary of State under Order of Secretary of State No. 11, relating to the conveyance of explosives by road, in mechanically driven vehicles. The use of fuel oil instead of petrol is a decided step in the direction of safety; but the use of a diesel lorry involved a severe handicap to the user owing to its increased axle weight compared with that of the petrol lorry and consequent increased tax based on the Ministry of Transport scale of taxation. In consideration therefore of the greatly reduced fire risk it was decided to allow the fire-resisting shield between the cab and the load to be dispensed with except for that portion protecting the exhaust pipe.

Carriage of Dangerous Goods

The Board of Trade Committee, of which Major Sir Thomas Crozier was chairman, completed their work and issued their report on March 2, 1933. The conditions laid down in the report now supersede those contained in the Memorandum relating to the Carriage of Dangerous Goods and Explosives in Ships.

At present there is a tendency for the carriage of dangerous goods by road to increase and if adequate safeguards are not taken the public will be exposed to risks from which they should be protected, either by reason of the substance itself, its packing or from some defect in the vehicle. It is a little difficult to assess the risk to which the public are exposed as there is no power to enforce the notification to any central authority of accidents on the road arising from the carriage of dangerous goods, and consequently there is no comprehensive official record of such accidents as have occurred. Inquiries have been made to ascertain whether details could be supplied on this point but without any result. In these circumstances the inspectors have had to collect such information as was available from local authorities, the police and other sources on the cases that have been reported or published in the Press. Authentic descriptions of some of these accidents serve to give some idea of the nature and risk attached to goods carried by road.

For instance, a motor lorry was carrying a consignment of liquid chlorine in three drums, when the driver noticed, in his mirror, at about 3.15 a.m., that the rear of the lorry was on fire. Each drum weighed about 30 cwt. and contained about 16 cwt. of liquid chlorine. He used his fire extinguisher but was not able to extinguish the fire. He tried to roll the drums off the lorry but could not move them. He then went to the police for assistance, when an explosion occurred, due to one drum being heated to such a high temperature that it burst. This drum was carried by the force of the explosion to a distance of about half a mile. It would seem that the force of the explosion removed the other two drums from the intense heat of the fire but sufficient pressure had been generated in the two remaining drums to reverse the curvature of both the ends of one drum and of one end of the other. The lorry was destroyed by the fire and considerable damage to property was caused by the explosion. The fire brigade were unable to get near the lorry for some time owing to the danger of the remaining two drums exploding.

In another case twelve cylinders containing compressed anhydrous ammonia fitted with valve caps fell from a lorry owing to the chains holding the tail board becoming detached. The valve of one of the cylinders fractured in the valve stem and the gas escaped. Several shops had to close owing to the strong smell of ammonia and the traffic was diverted.

A Roadside Fatality

A driver of a heavy open unsheeted lorry loaded with glass carboys containing formic acid in two tiers drew up at the side of the road at 1.30 a.m. for a rest and went to sleep. He had been on duty since 7 a.m. on the previous morning. Fog came on and enveloped the lorry, and at 5.30 a.m. a bus going from London to Newcastle with passengers collided with the lorry. The bus windows were smashed and the passengers were covered with acid. Three persons died and fifteen were injured. The carboys were in iron baskets packed with straw and were laced together with steel wire. No carboys actually came loose or fell off the lorry, but five were broken *in situ*.

Other accidents to lorries have involved hydrochloric acid, methyl alcohol, nitric acid, phosphorus oxychloride and sulphuric acid. In the latter cases there were twelve carboys of acid on the trailer secured with a rope. The rope broke and six of the carboys fell between the trailer and the lorry. In considering the risks of road transport, it is necessary to keep in mind those from fire or explosion due to possible interaction between two or more constituents of a mixed load. The need for uniformity as regards methods of packing between any road conveyance regulations and those already existing for rail and sea transport is also an essential consideration.

Use of Steam Pipes

The use of steam pipes was probably the cause of a fire which occurred at I.C.I. Metal Works on May 1. The fire broke out in the early hours of the morning in two buildings which were used for the hand loading of safety cartridges. The fire undoubtedly originated inside the building and as there were no stores liable to ignite spontaneously, the only possible cause appeared to be the ignition of accumulations of powder dust in the vicinity of the steam pipes, or the possible charring and subsequent spontaneous ignition of woodwork in contact with the steam pipes, or ignition of the charred wood by the accumulation of powder dust. Apparently it was possible for the steam pipes to reach a temperature of 350° F., which is sufficient to cause considerable charring of wood. The experience gained from this fire is the need for temperature control of the steam pipes by pressure valves, the placing of steam pipes so that they cannot come into contact with inflammable material, and so that they can be cleaned and the accumulation of powder dust prevented.

A fire illustrating the danger from the sun's rays also occurred at I.C.I. Metal Works on June 5. The factory was closed for the Whit Monday holiday and the fire occurred about 2 p.m. in a building in which the bulk of the contents was safety cartridges. It was thought, however, that some

tracer bullets were in a box on a shelf which would have been exposed for several hours to the hot sun, and that the sun melted the low melting-point solder, thus exposing the phosphorus in the bullet which would then ignite spontaneously. The fire spread rapidly owing to the wooden linings and, as the bolts were on the inside of the doors, there was great difficulty in obtaining access to the burning buildings. As a result of this accident it was decided to discontinue the system of indoor bolting and to fit locks which can be opened by the works manager's key. A further precaution in the case of fire is the lining, with non-inflammable material, of such buildings as have a definite fire risk.

This year only one serious accident occurred in connection with aluminium and chlorate compositions, as a result of which further evidence came to light as to the sensitivity of these compositions, even when damp. In this accident stars were being made, using a bronze former and bowl and during the act of tapping the star with a wooden mallet the ignition occurred. The composition was a mixture of aluminium, potassium chlorate and dextrine wetted with 10 per cent. of water. Experimental work indicated that although wetted compositions of the aluminium chlorate type are safe for malleting or drifting operations, care is still required.

An accident which occurred whilst a 90-gallon steel barrel was being cut by means of an oxy-acetylene flame, is of special interest. During the cutting process an explosion occurred which blew out the lower end of the barrel and made a hole in the floor boards about three feet by two feet, whilst the barrel lifted upwards and hit the operator on the forehead. The barrel was stated to have contained acetone vapour and it was alleged that it was filled with water and emptied before the cutting was commenced. This is instructive as acetone mixes with water and the explosive limits of acetone in air are from 2 to 13 per cent. of acetone vapour by volume.

Two explosions were reported in connection with oil fountains. In both cases the oil tank exploded and it was thought that this was due to excessive air pressure owing to the frost interfering with the working of the reducing valve and thus allowing the pressure in the tank to rise to a dangerous degree. It was recommended that the reducing valve should be housed inside a building and packed in a suitably insulated box to prevent a repetition of this kind.

A strange accident occurred in connection with the conveyance of fuel oil by road, which is not controlled by regulations. A fuel oil tanker was going up a long hill when there was an explosion and the manhole cover landed on the road ahead of the vehicle. The tank was fitted internally with an exhaust pipe heater, which was so arranged that the exhaust gases could be diverted through the heater or direct to the open air. There was a small quantity of oil in the tank and by mistake the heater was left in operation. It was thought that when the vehicle was going up the long hill the oil flowed to the rear and uncovered the heating pipe which got red hot and exploded the vapourised oil-air mixture.

Diffusional Processes

Some Problems Which Require Greater Attention

APPLICATIONS of the film concept in the petroleum refining industry were reviewed by Carl C. Monrad at a symposium on "Diffusional Processes," held under the chairmanship of Professor W. H. McAdams, at the Cleveland meeting of the American Chemical Society. During the past few years it has become apparent that many supposedly complex problems in various processes can be correlated by means of the concept "stagnant" films. In some cases the application is fairly simple, notably heat transfer and friction losses, but other of the more complex problems still have to be worked out. Among these are particularly deviations from equilibrium in absorption and fractionating towers and evaporation losses from tankage.

Diffusion of vapours through gas films was the subject of a joint paper by T. K. Sherwood and E. R. Gilliland. The nature of a gas film was discussed briefly and the application of the Stefan-Maxwell equation to diffusion in gas films explained. Rules were given for estimating the diffusion rate of a vapour through a gas film on the basis of data on the diffusion rate for another vapour.

Rate of Mixing Gases

The rate of mixing of gases in closed containers was dealt with by Allen S. Smith. It was shown that if complete mixing may be expected from general considerations the rate may be estimated from calculations of the diffusion co-efficient at the temperature and pressure existing in the container, and the application of Loschmidt's method for the measurement of diffusion. The results represent the theoretical maximum time involved.

Packing materials for fractionating columns were discussed by M. R. Fenske, C. O. Tongberg and D. Quiggle. The authors stated that in designing columns for the fractionation of Pennsylvania gasoline it was found necessary to develop a new type packing material of a much higher efficiency than any previously used in either laboratory or commercial work. As data on the efficiency of the packings are incomplete, are not always comparable and fail to take into consideration the effect of the height and diameter of the column in which the test was made, a study was made of various types of packing material which were available. Eleven columns ranging in diameter from 0.66 inch to 2.12 inches and in height from 27 inches to 156 inches were used and over twenty packing materials tested. Six different mixtures were employed for the determination of H.E.T.P. (height equivalent to a theoretical plate), and physical measurements of area, free space and static holdup were made on many of the packings. It was concluded that the best packings are 1-turn and 2-turn wire helices, 1-turn and 2-turn glass helices, carding teeth and No. 19 jack chain. An increase in height of packed section from 27 inches to approximately 66 or 116 inches and from approximately 66 to 116 inches reduces the efficiency of a packing. An increase in diameter from $\frac{3}{4}$ inch to 2 inches reduces the efficiency (increases the H.E.T.P.) of a packing. The effect of the rate of distillation varies with different packings and with the diameter of the column.

Moisture Movements in Drying

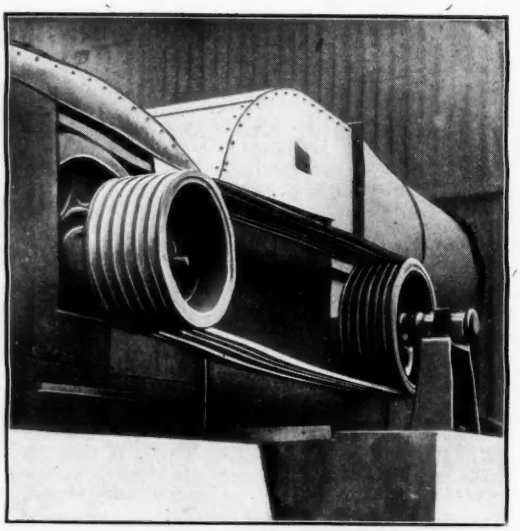
Moisture movement by capilliarity in the drying of granular materials was dealt with by E. W. Comings and T. K. Sherwood, who stated that in the air-drying of a granular solid, four diffusional resistances to moisture movement are encountered: the resistance to movement of liquid in the interior of the solid, the resistance to diffusion of water vapour through the air-filled passages in the solid, the resistance to vapour diffusion offered by the surface air film, and the eddy-diffusional resistance of the turbulent air stream. The mechanism of moisture movement within a granular solid was explained on the basis of the capillary forces encountered and used to explain still further the sharp increase in rate of drying, obtained near the middle of the drying period of a clay sample being dried in an open pan.

A method for the design of cooler-condensers for mixtures of vapours and inert gases was described by A. P. Colburn and O. A. Hougen. In condensing mixtures of vapours with non-condensing gases, not only does the heat transfer co-efficient vary widely from point to point in the apparatus, but the change in heat content of the mixture is not proportional to the change in temperature. For this reason no simple average condition can be used. The authors outlined a method of obtaining the required surface, in which values of $1/U\Delta t$ are estimated at a sufficient number of points to obtain an average value. The value of $U\Delta t$ is obtained by trial and error by equating the heat transferred through the condensate, the tube wall and the cooling water film, to the sum of the heat transferred by sensible cooling of the uncondensed gas and the latent heat equivalent to the amount of vapour transferred by diffusion.

Rope Drives Give Ideal Power Transmission at Short Centres

THE multiple V-rope drive is the ideal short centre drive. It has been in constant use for many years and is now employed by all industries for machinery and transmission drives from fractional horse-power upwards. Such a drive has a general efficiency of 98 per cent. Its chief characteristics, however, are exceptional strength and great flexibility; this enables the ropes to bend round minimum size pulleys with ease and without detrimental effect upon the ropes, thus ensuring the longest possible life. In addition, the ropes possess an inherent resiliency, reducing starting shocks to a minimum. They are not affected by moisture or atmospheric extremes, and the V-sections are true throughout the full length of the rope and do not distort in use.

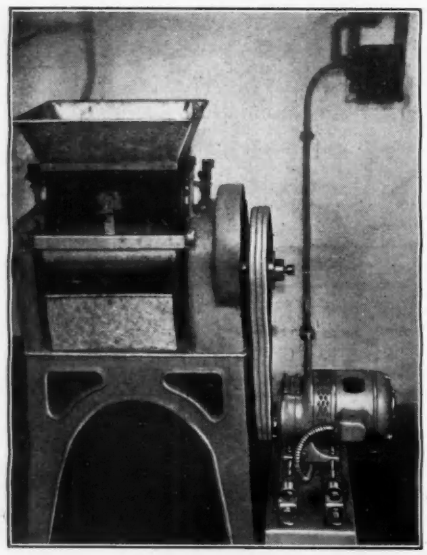
The "Sure-Grip" V-ropes, supplied by Crofts (Engineers), Ltd., also have a large base area which is specially designed for use as V-flat drives where required. Some typical installations, selected from many thousands of drives, are shown in the accompanying illustrations. These V-rope drives can be run at any angle from horizontal to vertical; no belt dressing or other preparation is required, and should not be used. To give an instance of their long life, it may be mentioned that a 400 h.p. multiple V-rope drive installed in 1901 is still giving satisfaction after being continuously in use for 32 years. Crofts' "Sure-Grip" V-rope drives are very simple to select, and the easiest to install of any drive made; they consist of two V-groove pulleys with the requisite number of endless "Sure-Grip" ropes required to transmit the specified power. The size and number of ropes required for any particular drive, however, depends not only upon the horse-power, speed, ratio, etc., but also upon the service conditions and operating characteristics of the driven machine. Ratios higher than 7 to 1 are not advisable unless the centre distance between the pulleys is sufficient to give not less than 120° arc of contact on the small pulley, but in no case should the arc of contact on the small pulley be less than 120°. The range of drives obtainable from stock normally covers powers up to 50 h.p., and the selection of any particular drive is facilitated by price lists with simplified tables which cover all shaft centres usually obtaining in general works practice.



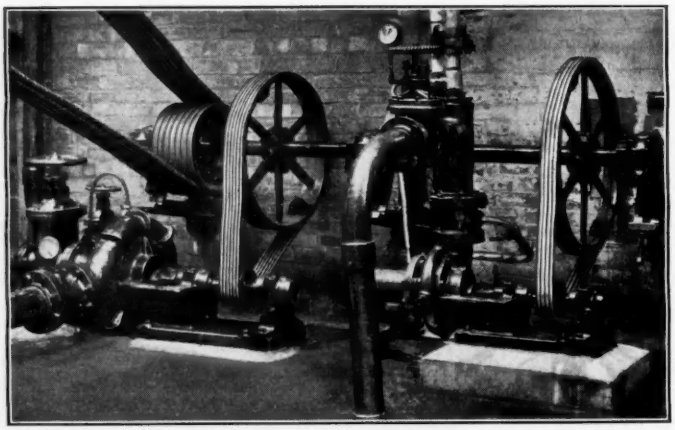
The V-Rope Drive has proved very efficient between the motor and the fan at this metallurgical plant.

Rope Tension Devices

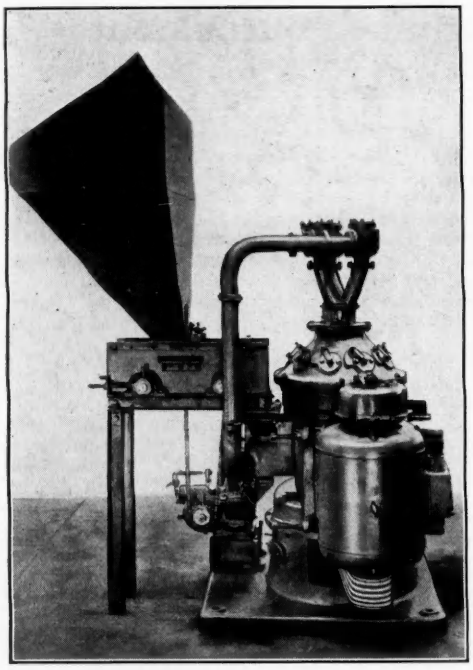
Rope tension devices can be provided to take up the natural sag of V-ropes where shaft centres are fixed. They may be fitted to bear either on the inside or outside face of ropes as required, and are provided with ball bearings and are easily assembled and adjusted. Where tension pulleys are to work on the back of the V-ropes they should be positioned close to the driving pulley and on the running off side, but where V-grooved tension pulleys are provided for working on the



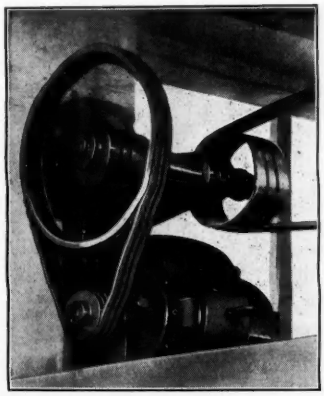
This machine is equipped with a geared motor and a V-Rope Drive, a speed reduction from 1425 to 120 r.p.m. being obtained.



Pumps at dyehouses provide another instance of the utility of the V-Rope Drive for power transmission.

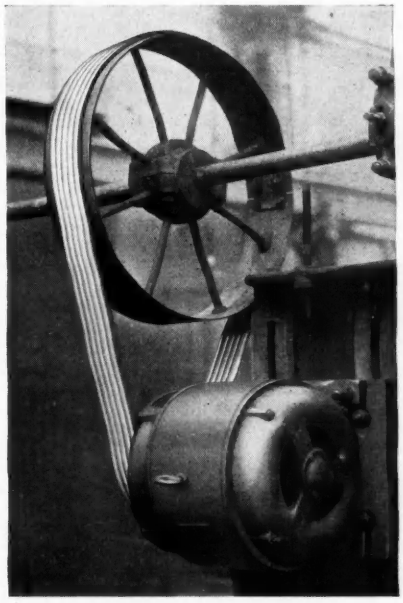


Left: **A vertical V-Rope Drive is incorporated in this pulverised fuel firing unit.**



Left: **In this reduction drive the centres of the motor pulley and countershaft pulley are almost at the minimum distance.**

Below: **The flat-faced pulley of this vertical line-shaft finds the V-Flat Drive very efficient.**



inside of the ropes, these should be fixed near the large driven pulley. When fixing the tension pulley excessive pressure should not be put on the ropes; the sag on the slack side of the ropes will be greatest when the V-rope drive is transmitting the full load. The tension pulley, moreover, should be so adjusted as to take up the sag with just sufficient contact to continue rotating when the pulley is run at the V-rope speed.

V-flat drives employ V-grooved driving pulleys and flat-faced driven pulleys, the transmission being effected by "Sure-Grip" V-ropes which are designed specially for V-flat driving, the large base area of the V-ropes ensuring ample contact with the flat face of the driven pulley. Such V-flat drives are employed for most cases of machinery and shafting drives; they have similar characteristics to complete V-rope drives, with the additional advantage that cheaper flat-faced driven pulleys (new or existing) can be used. Flat-faced flywheels, etc., can therefore be employed for driving machines by V-ropes; they run satisfactorily at any angle, vertical or horizontal. V-flat drives, moreover, are suitable for all speeds and ratios from 3 to 1 upwards

Self-Contained Reduction Driver

The reduction drive, which is shown in one of the accompanying illustrations, is a self-contained driving unit enabling any required speed reduction up to 7 to 1 ratio to be obtained. It embodies a "Sure-Grip" V-rope drive with either a special bracket or pedestals mounted on slide rails, upon which is also mounted the electric motor. The efficiency of the drive is as high as 98 per cent., it is inexpensive, clean, quiet running, and can be supplied to meet any horse-power and speed requirements.

When installing a V-rope drive it is necessary to see that the pulleys are in correct alignment and securely fixed to shafts by means of keys, setscrews, etc. Where the drive is from motor to shaft, the motor should be located so that maximum adjustment by means of slide rails can be obtained, *i.e.*, driving and driven shafts should be at minimum centres before fitting ropes. The "Sure-Grip" ropes are then placed on the pulleys, taking care not to damage them when placing over pulley grooves. When all the ropes are in position in the pulley grooves, it is necessary to start up the drive, and, when running, gradually tighten the ropes by means of motor adjusting screws in the slide rail; the tension, however, should not be too tight, nor should the ropes be slack. Speeds of "driving" and "driven" shaft should be checked on installation, and again at the end of five days, and then if required, tighten the V-ropes by means of the tension screws to take up the initial stretch of the ropes.

Crofts "Sure-Grip" ropes have exceptionally long life, but when a renewal is required it is advisable to replace the full set of ropes, the old ropes which are in good condition being held on hand ready for emergencies. Old and new ropes should not be mixed in one drive, as the old ropes will probably have stretched somewhat, consequently the new ropes would be taking the whole of the load, thereby resulting in excessive strain which will shorten their natural life.

Raw Materials in Venezuela

A National Laboratory to be Established

AN executive decree of June 4, 1934, provides for a National Laboratory and annexed school for expert chemists in Venezuela. The school is founded with the idea of providing Venezuela with a corps of chemists competent to examine and pass on the vast amount of raw material found in the Republic. The decree outlines in detail the management of the school, the courses to be followed, and the methods of examination of students. The National Laboratory is to perform analyses of all metallic, hydrocarbon, and fertilising materials found in the country, and is to lend its active co-operation to the technical sections of mines for the Ministry of Fomento.

The Chemical Age Lawn Tennis Tournament

To-day's Finals at Lower Sydenham

THE finals of the fourth annual CHEMICAL AGE Lawn Tennis Tournament will be played this (Saturday) afternoon at the Britannic House Club, Kangley Bridge Road, Lower Sydenham, by kind invitation of the Anglo-Persian Oil Company, Ltd. Play will commence at 3 o'clock prompt, and there are two matches to be decided—the men's singles and men's doubles. THE CHEMICAL AGE silver challenge cups will be presented to the winners, and, in addition, there are six silver statuettes to be won outright. Three "Invicta" statuettes, presented by Thomas Hill-Jones, Ltd., will be awarded to the two winners of the doubles and the winner of the singles respectively, and three similar "Lloyd-Willey" statuettes, kindly presented by Mr. W. Lloyd-Willey, of the same company, will be given to the two runnners-up of the doubles and the runner-up in the singles. Both matches promise to be productive of some excellent play. The finalists are:

SINGLES.

Baxter, Albert. United Yeast Co., Ltd., 238, City Road, London, E.C.1.	*v*	**Tunstall, P. A.** Salt Union, Ltd., 20, Water Street, Liverpool.

DOUBLES.

Hawley, F. G., & Haines, J. Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C.2.	*v*	**Prosser, V. J.,** John Haig & Co., Ltd., Kinnaird House, 2, Pall Mall East, London, **& Baxter, A.** United Yeast Co., Ltd., 238 City Road, London, E.C.1.

Competing in Both Matches

Whether he wins or loses, Baxter will be the hero of the day in playing in both the singles and doubles finals. A similar position arose last year, when R. C. Pennington (Joseph Crosfield and Sons, Ltd.) had to participate in both matches. Already in the tournament this year Baxter has played (in singles and doubles) no fewer than 192 games, of which 116 have been in his favour.

Tunstall reached the second round in 1933, at which stage he was beaten by R. C. Pennington. Geographical considerations and the chance of the draw have resulted in his meeting representatives of the Monsanto Chemical Works, Ltd., Ruabon, in three of the five rounds he has played so far this season, and on two occasions he has defeated players who shared the honour of winning the doubles cup in 1932.

Hawley and Haines, who entered the tournament for the first time in 1933, are the holders of the doubles cup, which they won on September 16 last year, at Dulwich, by defeating R. C. Pennington and R. George (Joseph Crosfield and Sons, Ltd.) by 6-3, 7-5 Their opponents to-day were also their opponents in the third round in 1933, Prosser and Baxter having been beaten on that occasion by 7-5, 7-5.

How They Have Reached the Finals

The following records show how the finalists have fared in the earlier rounds of the tournament:

SINGLES.

BAXTER, A.—1st round, beat W. G. C. Backinsell (Le Grand, Sutcliff and Gell, Ltd.), 6-4, 7-5; 2nd round, beat R. Law (Howards and Sons, Ltd.), 6-4, 6-1; 3rd round, beat G. F. Hammond (Williams, Hounslow, Ltd.), 6-1, 6-3; 4th round, beat A. S. Marcar (Bovril, Ltd.), 6-4, 6-4; semi-final, beat R. N. B. D. Bruce (Gas Light and Coke Co.), 6-3, 4-6, 8-6.

TUNSTALL, P.—1st round, bye; 2nd round, beat W. Speakman (Monsanto Chemical Works, Ltd.), 6-2, 6-3; 3rd round beat I. Williams (Monsanto Chemical Works, Ltd.), 7-5, 6-3; 4th round, beat S. E. Chaloner (Monsanto Chemical Works, Ltd.), 6-4, 7-9, 6-1; semi-final, beat L. F. Grape (Borax Consolidated, Ltd.), 6-1, 6-4.

DOUBLES.

HAWLEY, F. G., and HAINES, J.—1st round, walk over, E. M. Jones and R. C. Eden (B. Laporte, Ltd.), scratched; 2nd round, beat P. Smith and B. T. Francis (Bakelite, Ltd.), 6-1, 6-1; 3rd round, beat A. E. C. Willshere and L. F. Grape (Borax Consolidated, Ltd.), 6-1, 6-1; semi-final, beat A. S. Marcar and G. H. Trigg (Bovril, Ltd.), 6-3, 6-1.

PROSSER, V. J., and BAXTER, A.—1st round, walk over, C. H. Jones and P. N. Blythe-Brook (Anglo-Persian Oil Co., Ltd.), scratched; 2nd round, beat F. R. O. Allen and R. A. J. Bennett (Nobel Chemical Finishes, Ltd.), 6-2, 7-9, 6-1; 3rd round, beat E. H. M. Badger and R. N. B. D. Bruce (Gas Light and Coke Co.), 6-3, 6-4; semi-final, beat C. G. Copp and R. D. Hayman (Doulton and Co., Ltd.), 5-7, 6-4, 7-5.

The records of matches, sets and games played by the finalists to date are as follows:

SINGLES.

		Played.	Won.	Lost.
Baxter, A.	Matches	5	5	0
	Sets	11	10	1
	Games	108	67	41
Tunstall, P.	Matches	4	4	0
(Bye in first round)	Sets	9	8	1
	Games	88	56	32

DOUBLES.

Hawley, F. G., and Haines, J.	Matches	3	3	0
(Walk over in first round)	Sets	6	6	0
	Games	44	36	8
Prosser, V. J., and Baxter, A.	Matches	3	3	0
(Walk over in first round)	Sets	8	6	2
	Games	84	49	35

Mr. Keith Smith, of Bromley, has kindly consented to officiate as umpire for the doubles final. The cups and statuettes will be presented at the close of play by Mr. Gordon Robbins, deputy-chairman of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE.

New German Technical Books

Reviewed by Dr. Felix Singer

HERMANN SEGER, THE LIFE AND WORK OF A GERMAN SCIENTIFIC RESEARCH WORKER (Hermann Seger, Leben und Werk eines deutschen Forschers). By E. Erwin Urbschat. Berlin: Keramische Rundschau G.m.b.H.

The demand for a second edition of a little biography shortly after its first appearance, is in itself a better critique than a long statement of its contents and a warm and direct recommendation. Urbschat has attempted to present the life and work of Hermann Seger in a way which is as engaging as it is interesting, and thus gives an insight into the beginning of a new and flourishing period in ceramic research. The book is therefore equally interesting from the human and the scientific points of view, and Urbschat has set up a new memorial to the great ceramist, Seger.

* * *

ARTIFICIAL MATERIALS (Kunststoffe). By Dr. John Scheiber. Akedemische Verlagsgesellschaft m.b.H.

This volume appears in a collection edited by Max Le Blanc: "Results of applied physical chemistry" (Ergebnisse der angewandten physikalischen Chemie). We are dealing here with an occasional succession of single volumes which handle technical problems through the best experts. In the present one, Dr. Scheiber, of Leipzig, treats more especially of plastic bodies. He divides the book into artificial materials which are extracted from natural products of high molecular weight (rational synthetic products), and artificial materials which are extracted from products of a low molecular weight (regular synthetic artificial materials). He deals in detail principally with artificial materials from rubber, from cellulose and from albumenous products, and in the second group describes cellulose artificial materials, as well as amber and ivory artificial materials. A bibliography concludes this very interesting treatise which is calculated to give a survey of the field of artificial materials which are still gaining greatly in importance for industry.

Letters to the Editor

Medical Preparations for Sweden

SIR,—We learn that a Statutory Order has been issued in Sweden for the regulation of trade in proprietary medicines. This is of great importance to manufacturers and other exporters of medicated preparations to Sweden. The Order in Council came into force on July 1 last. A pharmaceutical speciality (proprietary medicine) may not be sold unless it has been entered on the register which is kept by the Medical Council who will allot a specific number to each registration. A committee of five members will be appointed by the King on the recommendation of the Council and the Board of Trade, which will assist the Council on matters concerning registration. Application must be made setting out details of each preparation to be sold in Sweden.

Under Section 16 of the Order, any person selling a pharmaceutical speciality that is not registered, shall be liable to punishment by fine. It is important that manufacturers and others concerned by this Order, who are already exporting to Sweden, should take immediate steps in the matter and in any case not later than December 31, 1934. We shall be pleased to furnish any of your readers with further information that may be required.—Yours faithfully,

REGINALD W. BARKER AND CO.

Vulcan House,
56 Ludgate Hill, E.C.4.

Monsanto Chemicals, Ltd.

£400,000 Issue Over-subscribed

ARRANGEMENTS have recently been made for the flotation of several industrial issues. One of the first was for Monsanto Chemicals, Ltd., the subscription lists for which were opened yesterday and have already been over-subscribed.

This new issue takes the form of 5½ per cent. redeemable cumulative preference shares of £1 each, and 400,000 were offered for subscription at 20s. 6d. per share. The company was originally founded in 1867. The prospectus shows, *inter alia,* that the business manufactures over 80 chemical products, and is one of the most important British manufacturers of chemicals, particularly those for the pharmaceutical and rubber trades. It is one of the leading British makers of such important products as pure phenol, cresylic acids, aspirin, salicylates, phenacetin, disinfectants, saccharin, and vanillin, which have a good market not only in England, but are exported to countries all over the world.

It is stated that the profits of the business being acquired, after charging all working expenses, management remuneration and depreciation, but before providing for income tax, for 1931 were £31,449, for 1932 £90,073, for 1933 £104,573, and for the six months ended June 30 last £61,994. The profits for 1933 were sufficient to cover the annual dividend required on the preference shares over 4½ times. The net assets, including the estimated net proceeds of the issue, amount to £685,059. Part of the proceeds of the issue will be used for increasing the existing plant and developing new extensions of the business. The board of directors and the entire staff will continue to serve the company.

Society of Public Analysts

Forthcoming Papers

THE next meeting of the Society of Public Analysts will be held on Wednesday, October 3, at the Chemical Society's Rooms, Burlington House, Piccadilly, W.1, at 8 p.m. Papers to be read include :—" The Determination of Lead in Biological Material, with Special Reference to Bone." By G. Roche Lynch, M.B., F.I.C.; R. H. Slater, D.Sc., Ph.D., A.I.C., and T. G. Osler, M.B., M.R.C.S.; " The Determination of 'Ethyl' Vanillin." By H. C. Lockwood, B.Sc., A.I.C.; " The Detection and Identification of Metallic Particles in Manufactured Products." By H. C. Lockwood, B.Sc., A.I.C. Arrangements have been made for members and their friends to dine together at Stewart and Co.'s Restaurant, 50 Old Bond Street, at 6.30 p.m.

Sir John Cass Technical Institute

Extension of the Institute Building

THE new session of the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C.3, which extends over about 36 weeks, will begin on September 24. Students will be enrolled next week. The Institute provides instruction in pure and applied mathematics, physics, chemistry, botany, zoology, bio-chemistry of fermentation (including malting and brewing), petroleum technology, fuel technology (including coal carbonisation and gas manufacture), metallurgy, assaying, geology, modern languages, arts and crafts and tailoring. The science courses are arranged to meet the requirements of those engaged in chemical, metallurgical, electrical, petroleum and fermentation industries, and are held from 6 to 10 p.m. Full facilities are provided in well-equipped laboratories for special investigations and research.

The instruction in experimental science also provides systemmatic courses for the examinations of London University, the Institute of Chemistry, and the Institute of Brewing. The principal or heads of departments will be pleased to advise intending students at the commencement of the session on the course they should undertake.

The extension of the Institute building has been made possible by the governing body acquiring the long Corporation of London lease of 2,000 years for the properties immediately adjoining the existing building on the north. The site, which is approximately 5,000 square feet, has allowed the frontage of the Institute to be extended by about 75 feet. The new wing, designed by Mr. Verner O. Rees, F.R.I.B.A., comprises a large hall (with stage), a refectory and kitchen, a staff common room, three large art rooms and additional laboratories and lecture rooms for metallurgy, physics, organic and bio-chemistry. The increased floor space thus provided has enabled the governors to re-arrange the accommodation in the original building on a more adequate basis and has made it possible to provide a new library and reading room, a students' common room and a new block of administrative offices; a new geology class room and museum, a new engraving room, a new research laboratory and an enlarged laboratory for inorganic and physical chemistry, and new laboratories for metallography and pyrometry, assaying and mechanical testing. The Earl of Athlone, Chancellor of the University of London, has consented to open the new wing on the afternoon of October 10.

Building Materials Research

D.I.S.R. Exhibit at Olympia

AT the International Building Trade Exhibition which is being held at Olympia, closing September 26, the Department of Scientific and Industrial Research have an exhibit illustrating much of the building research work carried out under its control, chiefly at the Building Research Station, Watford, and at the Forest Products Research Laboratory, Princes Risborough.

A selection of specimens are shown illustrating failures in concrete, resulting from the use of large proportions of fine sand, unstable aggregate or aggregate containing gypsum or a high proportion of organic matter. Further exhibits deal with light weight concretes, including a test used to detect unsound clinker; the mechanism of surface changes in cast stone during natural exposure; and the choice of pigments for the production of coloured concrete. Other exhibits include the action of sea water on reinforced concrete; Pozzolanas; the resistance of cement and concrete products to chemical attack; the constitution of cement clinker and set cement; various aspects of stone decay and the problems involved in the preservation.

Further sections deal with plaster, plastering sands, and paint failures on plastered surfaces; with the cause and prevention of pattern staining of plasters, that is the appearance of dark stains on plaster on lathing backings on ceiling and wall surfaces; and with problems concerning bituminous roofing materials. In the timber section exhibits will be found illustrating the seasoning of timber, including a display of matched materials which demonstrates that timber does not become more stable with age, but that the shrinkage of old timber is as great as that of new.

Continental Chemical Notes

THE CZECHO-SLOVAKIAN FIRM, Ludwig and Co., of Ossig, propose to manufacture pectin for the fruit-canning and jam industries.

* * *

THE BEHAVIOUR OF VITAMINS A AND D in hay during drying has been investigated by Rygh at the State Vitamin Institute at Oslo. Rapid drying is concluded to be most favourable to preservation of these vitamins.

* * *

MACADAM FOR ROAD CONSTRUCTION is now making great headway in Czecho-Slovakia since its introduction on a small scale in 1928. The estimated consumption for 1933 was over 8,000 tons.

* * *

AN AGREEMENT IS ANNOUNCED between the German Bemberg Co. and the Dormagen Copper Rayon Works of the I. G. Farbenindustrie. It covers the pooling of inventions and experience, exploitation of processes at home and abroad and the division of output and markets.

* * *

SULPHURIC ACID MANUFACTURE is to be undertaken, according to a Prague press report, by the Dudek A.-G. (Settenz), who will either utilise their own sulphur ores or will purchase the raw material, especially zinc blende. Sulphates are also included in the company's programme.

* * *

ITALIAN ASPHALT IS TO BE EXPLOITED as a raw material for liquid fuel by the S. A. Asfalti (A.B.C.D.), which has received a non-repeatable State subvention of 7 million lire on condition that the concern maintains its installation at Ragusa in Sicily in full running order for a period of 15 years.

* * *

THE QUESTION OF REVIVING the nitrocellulose rayon industry is raised by F. Ohl, in "Nitrocellulose." By abandoning the ether-alcohol solvent mixture in favour of cheaper solvents like acetone and ethyl acetate, nitro-rayon may be able to compete with the established types.

* * *

RUSSIAN POTASH INTERESTS are understood to have secured large contracts in Finland at prices below those of the German-French syndicate. The possibilities of the Russian potash industry may be realised by the fact that 3,500 tons of crude salts are produced each day in the Solikamsk region ("Metallbörse," September 8).

* * *

THE BEMBERG concern increased its output during 1933 in the spinning department while the weaving turnover was maintained at the previous year's level. Progress has been well maintained during the first five months of the present year.

* * *

SALTS OF GLUCONIC ACID now find application in pharmaceutical preparations. The free acid is prepared from grape sugar and related acids by a method discovered and elaborated by Isbel, based upon electrolytic oxidation of the sugar solution containing a small percentage of a bromide in the presence of calcium carbonate ("Chem.-Zeitung," August 25).

* * *

AN IMPROVED METHOD for transforming indigo blue into isatin described by the Russian workers, Rabinowitsch and Dsirkal, is based upon oxidation with technical sodium bichromate and sulphuric acid at 0° C. with vigorous stirring. Yields of 75 to 80 per cent. are said to be obtained by the process which compare favourably with the 50 to 55 per cent. yields obtained by the older methods ("Chemiker-Zeitung," September 1.)

* * *

A GOOD YIELD OF CRUDE PINE RESIN is reported from the Eastern Mark region of Germany where the output of 130,000 kg. is more than seven times that of last year's campaign when a somewhat larger area was tapped. In addition to 70 per cent. of best quality resin, the crude resin yields nearly 25 per cent. of turpentine. The latter, which analyses out at 82 per cent. pinene, is asserted to bear comparison with the best French and American turpentines.

BY A SPANISH GOVERNMENT DECREE the Petroleum Monopoly Co. is compelled to purchase an annual quantity of 200,000 hectolitres of 96-97 per cent. alcohol.

* * *

THE NEW ORGANISATION embracing the entire German chemical industry on the basis of the leadership principle is described in the "Chemisch Industrie," September 8. Herr Pfotenhauer is the leader of the group which comprises 17 sub-sections each with its own leader.

* * *

THE AUSTRIAN MAGNESITE INDUSTRY has benefited from the general world improvement in the heavy industries. The output of crude and sintered magnesite exported during the first six months of 1934 was 265,000 metric quintals as compared with 128,000 in the last corresponding period. Germany was the best customer with 103,000 metric quintals.

Key Industry Duty

Renewal of Exemptions for Chemicals

THE question of the renewal of the Safeguarding of Industries (Exemption) No. 3 Order, 1933, No. 4 Order, 1933, No. 1 Order, 1934, and No. 2 Order, 1934, made under Section 10 (5) of the Finance Act, 1926, is now under consideration by the Board of Trade. The articles covered by these Orders, which exempt them from duty until December 31, 1934, include:

COMPOUNDS OF RARE EARTH metals: Celtium oxide; dysprosium oxide; erbium oxide; europium oxide; gadolinium oxide; holmium oxide; lutecium oxide; neodymium oxide; praseodymium oxide; samarium oxide; scandium compounds; terbium oxide; thulium oxide; ytterbium oxide; yttrium oxide.

SYNTHETIC ORGANIC CHEMICALS, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes: Acid adipinic; acid filicic; acid isobutyl allyl barbituric; acid oxalic; acid propionic; alcohol amido ethyl; amido guanidine sulphate; amidopyrin (pyramidon; dimethylamidoantipyrine); ammonium perchlorate; barbitone (veronal; malonal; malourea; acid diethyl barbituric; diethylmalonylurea; hypnogen; deba); bromural (dormigene); butyl methyl adipate; calcium gluconate (calcium glyconate); chinoline (quinoline); chinosol; cocaine, crude; copper methyl arsenate; dial (acid diallyl barbituric); dicyandiamide; didial (ethyl morphine diallyl barbiturate); dimethyl sulphate; diphenyl; diphenyl oxide; elbon (cinnamoyl para oxyphenyl urea); ethyl abietate; ethyl cellulose; ethylene bromide; eukodal; furfurol; germanium oxide; glycol ethers; guaiacol carbonate (duotal); lead tetraethyl; lipoiodin; metaldehyde; methyl cellulose; methyl cyclohexanol methyl adipate; methyl sulphonal (diethylsulphonemethylethylmethane; trional); methylene chloride; nickel hydroxide; oxymethyl paraoxyphenyl benzylamine methyl sulphate; papverine; phenazone (antipyrine; phenyl dimethylpyrazolone; analgesin; anodynine; dimethyl oxychinizin); phenetidine, para-; phloroglucine; phytin; piperazine (diethylene-diamine; dispermin); R. potassium chlorate; potassium ethylxanthogenate (potassium xanthogenate); potassium guaiacol sulphonate (thiocol); R. potassium hydroxide (R. potassium caustic; R. potassium hydrate); R. potassium permanganate; pyramidon-veronal; quinine ethylcarbonate; radium compounds; salol (phenyl salicylate); sodium ethyl methyl butyl barbiturate; strontium carbonate; strontium nitrate; styracol (guaiacol cinnamate); sulphonal; synthalin; urea (carbamide).

Vanadium compounds: Vanadium-silica compounds specially prepared for use as catalysts for sulphuric acid manufacture.

Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great Queen Street, London, S.W.1, not later than October 12, 1934.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE steady improvement in business reported last week has been maintained, and prices are steady on the whole, though there have been a number of increases in the price of perfumery chemicals and essential oils. Moderate business had been transacted in industrial chemicals. A good demand continues for formaldehyde, formic and oxalic acids and sodium hyposulphite, and acetic acid, acetone, potassium compounds and salammoniac are meeting with a very fair demand. There is very keen competition for business in formaldehyde and salammoniac. Trade in arsenic, barium compounds and lithopone is rather slow, and the copper sulphate market is unsteady owing to the fluctuations in the price of the metal. Increased orders have been received for coal tar products and the outlook is brighter than of late. There has been a fair interest in pitch, and, although there has not been much sale for refined coal tar in the home market, there has been a certain amount of export trade. Xylol is a dull item. A fair business has been transacted in pharmaceutical chemicals and the tone of the market is steady. Chief interest has been shown in aspirin, citric and tartaric acids and phenacetin. Good trade has been reported in perfumery chemicals and essential oils.

LONDON.—The London chemical market is without any particular feature. Markets with few exceptions continue on quietly steady lines with the under-tone firm and values practically unchanged. The demand, all things considered, is reasonably satisfactory and deliveries under contracts are being called forward in fair quantities. Barium chloride, formic acid, soda phosphate, chlorate of potash are, if anything, firmer items. There is no change to report in the coal tar products market, and prices remain the same as last week.

MANCHESTER.—A satisfactory feature of the Manchester chemical market is the gradual return to more normal trading conditions after the spell of seasonal dulness. Holidays are still in progress in one or two Lancashire industrial centres, with a consequent interference with deliveries of materials, but such cases are now relatively few, and, in the aggregate, the quantities of chemicals that are being taken represent an improvement compared with any time last month. Unfortunately, conditions in the Lancashire cotton industry are no better, and this naturally tends to restrict the demand for chemicals for use in the dyeing and finishing establishments locally. In other directions, however, delivery specifications are better, although there is no great volume of contract buying going on at the present time. On the whole, the general price position remains steady so far as the main body of chemicals is concerned. With regard to the by-products there has been little change in values this week.

SCOTLAND.—The Scottish heavy chemical market is maintaining the improvement shown during the previous week.

Price Changes.

General Chemicals.—ACID, OXALIC (Manchester), £48 10s. to £53 per ton, ex store; ARSENIC, white powdered Cornish (Manchester), £21 per ton ex store; CADMIUM SULPHIDE, 2s. 5d. to 2s. 9d. per lb.; RUPRON (mineral rubber), £14 10s. per ton; POTASSIUM PRUSSIATE, yellow (Manchester), 8½d. per lb.

Coal Tar Products.—NAPHTHA, solvent, 95/160, 1s. 7d. per gal.; TOLUOL, 90%, 1s. 11d. to 2s. per gal.

(See also "Perfumery Chemicals" and "Essential Oils.")

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON. £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—9d. per lb. less 5%.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £43 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £53 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 1s. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0½d.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powered Cornish, £21 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 5d. to 2s. 9d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £26 per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resumblimed B.P., 6s. 3d. per lb. for quantities not less than 28 lb., increasing to 8s. 4d. per lb. for quantities less than 4 lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 10s.

LEAD, NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.
LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.
LITHOPONE.—30%, £17 10s. to £18 per ton.
MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.
METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.
NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.
NICKEL SULPHATE.—£49 per ton d/d.
PHENOL.—8½d. to 9d. per lb. without engagement.
POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £37 10s.
POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.
POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb. for quantities not less than 28 lb.
POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8¾d.; B.P., 9½d.
POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.
RUPRON (MINERAL RUBBER).—£14 10s. per ton.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb. for quantities not less than 28 lb.
SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8¼d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7d. to 7¼d. per lb.; crude, 1s. 9d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 6d.; dark, 95/97%, 1s. 3d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 4d. to 4¼d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¾d. f.o.r. North; 4d. London. MANCHESTER: 3¼d. to 4¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4¾d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 57s. 6d. per ton, in bulk, at makers' works. LONDON: £3 per ton f.o.b. East Coast port for next season's delivery.
PYRIDINE.—90/140, 7s. 6d. to 9s. per gal.; 90/180, 2s. 3d. per gal.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 3d.
XYLOL.—Commercial, 2s. per gal.; pure, 2s. 3d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Perfumery Chemicals

ACETOPHENONE.—6s. 3d. per lb.
AMYL CALICYLATE.—2s. 6d. per lb.
ANETHOL, 21/22° C.—4s. per lb.
BENZYL BENZOATE.—2s. 6d. per lb.
CINNAMIC ALDEHYDE, NATURAL.—12s. per lb.
CITRAL.—7s. per lb.
COUMARIN.—8s. per lb.
ETHYL CINNAMATE.—7s. 9d. per lb.
ETHYL PHTHALATE.—2s. 3d. per lb.
GERANIOL (PALMAROSA).—15s. 6d. per lb.
GERANIOL.—5s. to 10s. per lb.
LINALOL (EX BOIS DE ROSE).—7s. 3d. per lb.
LINALOL (EX SHUI OIL).—4s. 9d. per lb.
METHYL ANTHRANILATE.—8s. per lb.

METHYL BENZOATE.—4s. per lb.
NEROLIN.—4s. 6d. per lb.
PHENYL ETHYL ACETATE.—8s. 6d. per lb.
PHENYL ETHYL ALCOHOL.—7s. per lb.
RHODINOL.—58s. per lb.
SAFROL.—1s. 10d. per lb.
LINALYL ACETATE (EX BOIS DE ROSE).—8s. 6d. per lb.
LINALYL ACETATE (EX SHUI OIL).—6s. 3d. per lb.

Essential Oils

ANISE.—2s. 1½d. per lb.
BERGAMOT.—6s. 3d. per lb.
CAMPHOR, WHTIE.—1s. per lb.
CANANGA, JAVA.—9s. 3d. per lb.
CINNAMON, CEYLON.—3s. 6d. per lb.
CASSIA, 80/85%.—4s. 9d. per lb.
CIRONELLA, JAVA.—1s. 10d. per lb.
CLOVE, 90/92%, ENGLISH.—4s. 4d. per lb.
LAVENDER, MONT BLANC, 38/40%.—18s. per lb.
LEMONGRASS.—4s. 9d. per lb.
ORANGE, SWEET.—6s. per lb.
PALMA ROSA.—7s. 3d. per lb.
PEPPERMINT, JAPANESE.—4s. 6d. per lb.
PEPPERMINT, WAYNE COUNTY.—15s. per lb.
PETITGRAIN.—4s. 9d. per lb.

Wood Distillation Production

ACETATE OF LIME.—Brown, £9 to £10. Grey, £15 to £16. Liquor, brown, 30° Tw., 7d. to 9d. per gal. MANCHESTER: Brown, £12 10s.; grey, £17 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL,—95s. to 110s. per cwt.
CHARCOAL.—£6 5s. to £10 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 9d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal. Solvent, 3s. 9d. to 4s. 6d. per gal.
WOOD TAR.—£2 to £4 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—September £6 16s., October £6 17s. 6d., November £6 19s., December £7, January, 1935, £7 2s., February £7 3s. 6d., March/June £7 5s. for neutral quality basis 20.6 per cent. nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—September £6 16s. 3d., October £6 17s. 6d., November £6 18s. 9d., December £7, January, 1935, £7 1s. 3d., February £8 2s. 6d., March £7 3s. 9d., April/June £7 5s., delivered in 4-ton lots to farmer's station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. or 16 per cent. nitrogen.
NITRO-CHALK.—£7 5s. per ton for delivery upto June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, Sept. 12.—LINSEED OIL was firm, Spot, £21 (small quantities 30s. extra); Sept.-Dec., £19 17s. 6d.; Jan.-April, £20 2s. 6d.; May-Aug., £20 7s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), Sept.-Oct. shipment, £14 10s. per ton. RAPE OIL was slow. Crude extracted, £27; technical refined, £28 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £14; refined common edible, £17 5s.; deodorised, £18 15s. naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 41s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £20 10s. per ton; Sept.-Dec. and Jan.-April, £20 5s., naked. COTTON OIL, Egyptian, crude, spot, £14 5s.; edible, refined, spot, £16 5s.; technical, spot, £16 5s.; deodorised, £18 5s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £14 10s., naked. GROUNDNUT OIL, extracted, spot, £20 10s.; deodorised, £24 10s. RAPE OIL, extracted, spot, £26; refined, £27 10s. SOYA OIL, extracted, spot, £16 10s.; deodorised, £19 10s. per ton. COD OIL, industrial, 25s. per cwt. CASTOR OIL, pharmaceutical, 36s.; first, 31s.; second, 28s. jer cwt. TURPENTINE, American, spot, 43s. 3d. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Preparation of Mucins

PURIFIED mucins are obtained from animal viscera by treating the material, *e.g.*, mucous membranes of the stomach and intestines, with dilute acid to remove the diastases, which go into solution, treating the residue with alkali solution to dissolve the mucins and filtering from the insoluble albuminoid substances. The mucin is obtained from the solution of alkali mucinate by precipitation with acid at $pH = 6$. (See Specification 410,649 of Soc. Anon. des Laboratoires Robert et Carriere and R. H. Monceaux.)

Reduction of Tar Acids

TAR acids are reduced to aromatic hydrocarbons at atmospheric pressure in the presence of catalysts obtained by subjecting hydrated gel-like materials, such as silica and alumina gels or bauxite, to heat treatment at a temperature of 450—650° C. to increase their stability to impregnation and then impregnating the material with ammonium molybdate solution. According to an example, such a catalyst is used for the reduction of *m*-cresol and after ten runs, during which the catalyst was revivified three times by heating with air, oxygen, or gases containing oxygen at temperatures from 450—600° C., the amount of unchanged cresol in the product was 4.0 per cent. (See Specification 410,771 of J. G. King and M. A. Matthews.)

Oxalic Acid

POTASSIUM sulphate is converted into formate by the action of an alkaline earth formate or components yielding the same, followed by conversion of the formate into oxalate by heating at temperatures of 300—450 deg. C., and preferably under reduced pressure. This product is then treated with alkaline earth hydroxide to give caustic potash lye and alkaline earth oxalate, the former of which is separated off and concentrated if desired, while the latter is treated with mineral acids to convert into oxalic acid. (See Specification 412,776 of R. Koepp and Co. Chemische Fabrik Akt.-Ges.)

Bleaching Processes

VEGETABLE fibres, *e.g.*, cotton, hemp, linen, sisal or jute are partially bleached in a bath containing an aluminium salt and a reducing salt derived from sulphur. The complete bleaching of the fibres may then be effected very readily with the usual oxidising or other bleaching processes. In an example, hanks of cotton are partially bleached in a bath containing sulphate of alumina and sodium bisulphite, and the bleaching completed, if necessary, with a small quantity of chlorine. (See Specification 412,793 of L. Peufaillit.)

Amino Acids

AMINO acids are obtained from substances containing keratin by heating with strontium oxide or hydroxide at over 100° C., with or without excess pressure, the strontium being subsequently precipitated with alkali carbonate and the solution neutralised by boric or phosphoric acid. A high yield of cystine, tyrosine and tryptophane is referred to. According to examples, hair substance is treated with strontium hydroxide with or without pressure, and the product further treated as described above. (See Specification 411,009 of C. F. Ferstl.)

Complete Specifications Open to Public Inspection

PURIFYING NICKEL.—Soc. d'Electro-Chimie, d'Electro-Metallurgie, et des Acieries Electriques d'Uugine. March 1, 1933. 3029/34.

PRIMARY DITERPENE ALCOHOLS, manufacture.—Soc. of Chemical Industry in Basle. March 3, 1933. 6351/34.

ARTIFICIAL MASSES, manufacture and production.—I. G. Farbenindustrie. March 2, 1933. 6445/34.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Feb. 28, 1933. 6508/34.

ACID WOOL-DYESTUFFS of the anthraquinone series, manufacture. I. G. Farbenindustrie. March 1, 1933. 6595/34.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. March 1, 1933. 6641/34.

SULPHONIC ACID and carboxylic acid derivatives of 1 : 3-diaryl-5-pyrazolones, manufacture.—I. G. Farbenindustrie. March 3, 1933. 6979/34.

QUATERNARY AMMONIUM COMPOUNDS, manufacture and application.—I. G. Farbenindustrie. March 3, 1933. 6989/34.

Specifications Accepted with Dates of Application

AZO DYESTUFFS and the application thereof.—Imperial Chemical Industries, Ltd., S. Coffey, M. Lapworth, and W. A. Sexton. Nov. 30, 1932. 415,753.

PRODUCTION OF MASSES consisting of or containing cellulose esters and/or ethers.—F. J. Farrell and A. A. Lautenberg. Dec. 29, 1932. 415,728.

DYESTUFF PASTES, manufacture.—W. W. Groves (I. G. Farbenindustrie). Dec. 30, 1932. 415,742.

MALEIC OR PHTHALIC ANHYDRIDE, production.—A. L. Mond (National Aniline and Chemical Co., Inc.). Jan. 27, 1933. 415,748.

DYESTUFFS, manufacture.—I. G. Farbenindustrie. Jan. 27, 1932. 415,749.

COMPOSITIONS CONTAINING CELLULOSE DERIVATIVES and products made therefrom, manufacture.—R. Burns, D. Traill, and Imperial Chemical Industries, Ltd. Feb. 3, 1933. 415,764.

THERAPEUTIC MEDIA, manufacture.—I. G. Farbenindustrie. Feb. 29, 1932. 415,715.

ACID AMIDE DERIVATIVES, process for the manufacture.—I. G. Farbenindustrie. Feb. 29, 1932. 415,718.

REACTION PRODUCTS from natural or synthetic waxes of the ester type, manufacture.—I. G. Farbenindustrie. March 3, 1932. 415,789.

VULCANISATION OF RUBBER.—I. G. Farbenindustrie. March 3, 1932. 415,790.

LIQUID HYDROCARBONS suitable for use as motor spirit, production.—M. P. Applebey, C. Cockram, and Imperial Chemical Industries, Ltd. March 3, 1933. 415,792.

MOTOR SPIRIT, production.—G. F. Horsley and Imperial Chemical Industries, Ltd. March 3, 1933. 415,793.

TEXTILE ADJUVANTS, manufacture.—Soc. of Chemical Industry in Basle. July 15, 1932. 415,877.

DYEING LEATHER, process.—Soc. of Chemical Industry in Basle. Dec. 21, 1932. 415,924.

ORTHO-OXYAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Dec. 7, 1932. 415,925.

CONDENSATION PRODUCTS from phlorogluciuol and aromatic amines, manufacture.—I. G. Farbenindustrie. Jan. 20, 1933. 415,945.

SILVER HALIDE EMULSIONS, process for sensitising photographic. I. G. Farbenindustrie. Jan. 26, 1933. 415,949.

VULCANISABLE RUBBER-CONTAINING MIXTURE.—Naugatuck Chemical Co. Aug. 18, 1933. 415,954.

FLUOSILICATES, preparation.—International Refining Co., Ltd. (Dr. L. Brann). March 26, 1934. 415,972.

Applications for Patents

August 30 to September 5 inclusive.

ORGANIC DERIVATIVES OF ARSENIC, production.—L. Anderson, Boot's Pure Drug Co., Ltd., and F. L. Pyman. 25600.

DYEING TEXTILE FIBRES, etc.—J. Brandwood. 24946.

PRIMARY SODIUM PHOSPHATE, *etc.*, manufacture.—Chemische Fabrik Budenheim. (Germany, Nov. 2, '33.) 25019.

ACTIVATED CARBON, manufacture.—R. G. W. Farnell. 25228.

POLYGLYCEROL ESTERS, production.—R. Furness and Lever Bros., Ltd. 25491.

WASHING PREPARATIONS, etc., manufacture.—R. Furness. 25492.

ASCORBIC ACID, etc., manufacture.—W. N. Haworth, E. L. Hirst, J. K. N. Jones and F. Smith. 25205.

SOLID PRODUCT CONTAINING CHLORINE, production.—I. G. Farbenindustrie. (Germany, Oct. 21, '33.) 24992.

MANUFACTURE of 3 : 4 : 5 : 6-tetrahalogen-2-amino-1-oxybenzenes. I. G. Farbenindustrie. (Germany, Nov. 2, '33.) 24998.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Aug. 30, '33.) 25027.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Sept. 6, '33.) 25307.

NON-INFLAMMABLE PLASTIC MASSES.—Imperial Chemical Industries, Ltd. 25355.

PREPARATION of 2, 4-dimethyl-pentyl ethyl barbituric acid, etc. L. Mellersh-Jackson (Lilly and Co.). 25486.

PREPARATION of 2-ethyl-hexyl ethyl barbituric acid, etc.—L. Mellersh-Jackson. 25487.

CYANIC ACID, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 25215.

AZO DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 25216.

AMINES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 25308.

ESTERS FROM OLEFINES, production.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. (United States, Sept. 2, '33.) 25218.

WATER SOFTENERS.—Victor Chemical Works. (United States, Sept. 5, '33.) 25365. (United States, Sept. 5, '33.) 25366.

Company News

A. Boake Roberts & Co.—An interim dividend of 2 per cent., tax free, is announced on the ordinary shares.

Celanese Corporation of America.—The directors have declared a quarterly dividend of $1.75 per share on the 7 per cent. cumulative series prior preferred stock, payable on October 1.

Calico Printers' Association.—The results for the year to June 30 last show a net profit of £164,872, compared with £123,926 in 1932-33. The annual meeting will be held in Manchester on September 19, at 11 a.m.

Canadian Celanese, Ltd.—The directors have declared on the 7 per cent. cumulative participating preferred stock a quarterly dividend of $1.75 per share, and a further dividend of 75 cents per share on account of arrears, both payable on September 30.

United Turkey Red Co.—It is announced that the dividend on the first preference shares for the half-year to June 30 will be paid on September 26, but the consideration of a dividend on the second preference has been deferred until the results of the year's trading are available.

Imperial Chemical Industries, Ltd.—The directors have declared, in respect of the year 1934, an ordinary interim of 2½ per cent., payable, less tax at 4s. 1d., on November 1 to shareholders registered on September 20. A similar payment was made a year ago, followed by a final dividend of 5 per cent., making 7½ per cent. for the year 1933.

New Companies Registered

Monsanto Chemicals, Ltd.—Registered September 10. Nominal capital £1,000. Manufacturing chemists, carbolic acid manufacturers, picric acid makers, coke, tar and gas producers, etc. A subscriber: Geo. Conrad, 103 Phyllis Avenue, New Malden.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Trinidad.—A firm of manufacturers' agents in Port of Spain wishes to obtain the representation of United Kingdom manufacturers of engineers' packings (all kinds); beltings (leather, balata, rubber and canvas); rubber hose; canvas hose; genuine raw and boiled linseed oils; olive and castor oils, etc., on a commission basis, for Trinidad. (Ref. 234.)

Canada.—A firm of manufacturers' agents at Montreal desires to obtain the representation of United Kingdom manufacturers of temperature and pressure regulators, pneumatic ash handling systems, and unit heaters, either on a commission, purchasing or consignment basis, in Eastern Canada. (Ref. No. 237.)

New Zealand.—The British Trade Commissioner at Wellington reports that the Post and Telegraph Department is calling for tenders, to be presented in Wellington by November 1, 1934, for the supply of 2,400 lbs. of sealing compound. (Ref. A. Y. 12614.)

New Zealand.—The British Trade Commissioner at Wellington reports that the New Zealand Public Works Department are calling for tenders, to be presented in Wellington by October 23, 1934, for the supply of one combined forebay water level recorder and spillway flow integrator; and one tailrace water level recorder. (Ref. A.Y. 12615.)

South Africa.—The Senior British Trade Commissioner in South Africa reports that the South African Railways and Harbours are calling for tenders, to be presented in Johannesburg by November 19, 1934, for the supply of refrigerating plant for the pre-cooling of mostly citrus fruit in a store of 1,500 cubic tons capacity. (Ref. A.Y. 12608.)

South Africa.—The British Trade Commissioner at Johannesburg reports that the Johannesburg City Council are calling for tenders, to be presented in Johannesburg by October 25, 1934, for the supply of gasworks plant in connection with an extension to the existing retort, capable of carbonising 100 tons of coal per day. (Ref. A.Y. 12616.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields are calling for tenders, to be presented in Buenos Aires by October 8, 1934, for the supply of 10,000 barrel-shaped steel drums for petroleum distillates. (Ref. G.Y. 14257.)

THE Irish Free State Minister for Industry and Commerce has guaranteed a trade loan of £4,000 for a period of 14 years to Gypsum and Bricks, Ltd., Kingscourt, County Cavan, for the purpose of erecting new buildings and machinery to mine gypsum.

MONSANTO CHEMICALS
LIMITED.

Issue of 400,000 5½ per cent. Redeemable Cumulative Preference Shares of £1 each at 20s. 6d. per share.

The SUBSCRIPTION LIST for the above ISSUE was closed yesterday, FRIDAY, SEPTEMBER 14th, 1934, the Issue having been OVERSUBSCRIBED

The Bankers :

NATIONAL PROVINCIAL BANK LTD., and Branches.

The Solicitors :

CLIFFORD-TURNER & CO., 81/87 Gresham Street, London, E.C.2

The Brokers :

MYERS & COMPANY, 19 Throgmorton Avenue, London, E.C.2

From Week to Week

MR. SYDNEY ORME (55), of Brookville, Hartford, Cheshire, of Imperial Chemical Industries, Ltd., Northwich, left £9,918 (net personalty £9,205).

MEMBERS OF THE BRITISH ASSOCIATION, at Aberdeen, spent the afternoon of September 6, at the Stoneywood Works of A. Pirie and Sons, Ltd., Bucksburn. The company were afterwards hospitably entertained by Captain and Mrs. Allen.

THE DUBLIN CORPORATION VOCATIONAL EDUCATION COMMITTEE is to organise a special course in industrial chemistry at its technical schools this year. The instructors in the chemistry courses are Messrs. P. B. Foy, P. O'Callaghan, G. A. Watson, H. Thornton, B. G. Fagan, F. Nolan and P. J. Hurley.

MR. G. W. FRASER HOLROYD, head of the science department at Blackburn Technical College, has died in Hampstead Hospital, aged 63. Mr. Holroyd joined the college staff fifteen years ago as assistant to Dr. Pickard, whom he succeeded as head of the department. Mr. Holroyd, who was educated at Winchester and Oxford, was previously engaged for many years in industrial chemistry.

DR. VICTOR HAUKMAN, the State geologist for Finland, confirms the report that borings made at Kaulatunturi have led to the discovery of a nickel vein of approximately 12 ft. in depth. Borings have extended to a depth of 350 feet, and preliminary investigations indicate a very rich strike. Under the terms of a contract announced at the end of June last the Mond Nickel Co. has the right to export and sell all nickel products obtained in Finland. Under concession terms, a royalty of 5 per cent. is payable to the Finnish Government based on the current price.

ROBERT BOWRAN AND CO., LTD., of 4 St. Nicholas' Buildings, Newcastle-upon-Tyne, 1, have announced that important changes in their activities, which have taken place since the company was incorporated in 1909, necessitate a complete revision of their Memorandum of Association. In effecting this change they are compelled to liquidate the present Company and continue its activities under the new title of "Robert Bowran and Co. (1934), Ltd." This alteration is being made under expert legal advice and it affects merely the internal organisation of the company. The change will take place as and from October 1, next.

IMPORTANT EXTENSIONS TO THEIR COKING PLANT are being carried out by Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, one of the largest industrial undertakings in the country. Contracts have been placed for the erection of a new battery of 24 coking ovens and the necessary by-product plant which this involves. The output of this section of the works, it is anticipated, will be almost doubled as a result of the developments, which will provide work for many men. Work on the extension has already started, but it is expected that it will be nine months before the whole of the new plant will be in operation.

SHAREHOLDERS of the Triplex Safety Glass Co. were advised last month of the board's intention to recommend a dividend of 25 per cent. for the year ended June 30 last, that being similar to the payment made for the preceding period. They were thus prepared for another excellent report, but the results of operations as now disclosed are even better than was generally expected. Net earnings, after providing for income-tax, amount to £75,170, which compare with £55,631 secured in the previous year. This very satisfactory result is entirely due to the company's own operations, no dividends having been received during the year from holdings of shares in associated undertakings.

MR. F. W. FIELD, H.M. Senior Trade Commissioner in Canada, is at present in this country on an official visit. Mr. Field will be available at the Department of Overseas Trade on Monday, September 24, for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Canada, after which Mr. Field will visit a number of industrial centres in the provinces. Firms desiring an interview with Mr. Field in London, or information regarding his arrangements to visit provincial centres, should apply to the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1, quoting the reference 11952/1934.

FOR THE FIRST TIME "Element 91," a powerful radio-active substance similar to radium and, it is said, equally useful in the treatment of cancer, has been isolated. Dr. Aristid von Grosse, of Chicago University, who has isolated this element, called protactinium, says that while a gram of radium costs £20,000 to £25,000, a similar quantity of protactinium will cost only £600. The American Chemical Society, meeting at Cleveland, has been shown the element, plainly visible under a magnifying glass as tiny silvery beads. It is the rarest metal in nature, for out of 10,000,000 parts of pitch-blende only one part of protactinium can be extracted. Even more important than the isolation of this element is the fact that Element 91 naturally disintegrates into actinium, which is 140 times more active than radium. Until her death the late Mme. Curie worked unsuccessfully on the isolation of actinium, which Dr. von Grosse says will in a year or two be available to science and medicine.

THE TOTAL VALUE OF CHEMICALS, chemical fertilisers, drugs and similar products imported into the Irish Free State during July last was £99,126, as compared with £101,373 in the corresponding month of 1933.

THE YORKSHIRE SUGAR CO.'S factory at Selby have opened their weighbridges for the acceptance of loads of beet, and sugar-making is starting. The sugar-making season will last about 16 weeks, dealing with about 150,000 tons of beet.

DAMAGE TO PROPERTY AND LOSS OF STOCK, estimated at £1,000, was occasioned by a fire which completely gutted the factory of the Applam Fruit Products Co., pectin manufacturers, at Norton Fitzwarren, near Taunton, on September 8.

INTERNATIONAL COMBUSTION, LTD., Grinding, Screening and Filtering Division, report recent orders for England covering a 3 roller "Baby" Raymond mill for grinding various oxides; a No. 1 Raymond screen pulveriser for screening dry colours; and 3 ft. by 5 ft. and 4 ft. by 5 ft. Hummer electric screens for screening graphite and fireclay.

THE ACETEX SAFETY GLASS CO., one of the concerns formed in 1928 during the short-lived boomlet in safety-glass company flotations, is to wind up. In respect of the year ended June 30 last there was a net loss of £4,484, which increases the debit carried forward to £59,585. No dividend has yet been paid. The board have come to the conclusion that it is impracticable either to carry on the business or amalgamate with another company. They advise liquidation as the only means of ensuring some return to shareholders. The issued capital is approximately £196,000.

CONSIDERABLE BRITISH CAPITAL will be involved in the exploitation by the Anglo-Persian Oil Co. of the new Persian oilfield known as Naft-I-Shah. The oilfield is a few miles from the Iraq frontier in the neighbourhood of the town of Khanaquin. Oil will be pumped through a pipeline more than a hundred miles long to Kermanshah, where a refinery is being constructed. From Kermanshah, the petrol and other oil products will be distributed to all parts of Northern Persia.

THE IRISH FREE STATE GOVERNMENT'S plan will cover the production of 600,000 gallons of industrial alcohol in the first year of operation. About 100,000 gallons are expected to be required for ordinary industrial use, whilst the balance will be available for mixing with petrol for use as motor fuel. The importation of industrial alcohol will be prohibited. Although the production is scheduled to start next year, sites for the distilleries and refinery have not yet been acquired.

THE IMPORT DUTIES ADVISORY COMMITTEE has under consideration the question of the continuance, after the date of expiry of the Import Duties (Drawback) (No. 17) Order, 1933, of drawback under Section 9 of the Finance Act, 1932, in respect of linseed or linseed oil used in the manufacture of the various kinds of goods specified in the Order. Representations which interested parties may desire to make should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than October 8, 1934.

ADDITIONAL IMPORT DUTIES (No. 31) ORDER, 1934, issued by the Treasury this week, on the recommendation of the Import Duties Advisory Committee increases the Customs duty on zinc sheets, strip, plates, discs, and circles, as from September 13, 1934, at the rate of £5 a ton or 15 per cent. of the value of the goods, whichever is the greater. The Committee states that steps have recently been taken to establish the zinc-rolling industry on a larger basis in this country, but that with the intensive foreign competition the industry will have great difficulty in making progress unless it is afforded additional protection. In making their recommendation they have given careful consideration to the interests of the users of these zinc products.

ONE OF THE MOST NOTABLE MEN in the china clay district of St. Austell has been removed by the death of Mr. John Wheeler Higman, J.P., which occurred on September 7, at Polgray, following a long indisposition, in his 82nd year. Throughout the major portion of his life he had been concerned with the growth and development of the china clay industry. He was the son of the late Mr. Henry Wheeler Higman, one of the pioneers of the industry and founder of the firm of John W. Higman and Co., a firm which did an enormous business with the United States. Mr. Higman was the first chairman of the China Clay Association and subsequently one of its joint managing directors until its disbandment. He was also the first chairman of the Joint Industrial Council of the china clay industry, whose work of conciliating the interests of the employer and employed, immediately after the war, contributed so much to the smooth working of the industry. Some years ago when Mr. Higman retired from business life the several china clay works under his control were acquired by H. D. Pochin and Co., and are now absorbed by the English Clays, Lovering, Pochin and Co., Ltd. In Freemasonry he was the oldest Past-Master of the St. Austell Lodge.